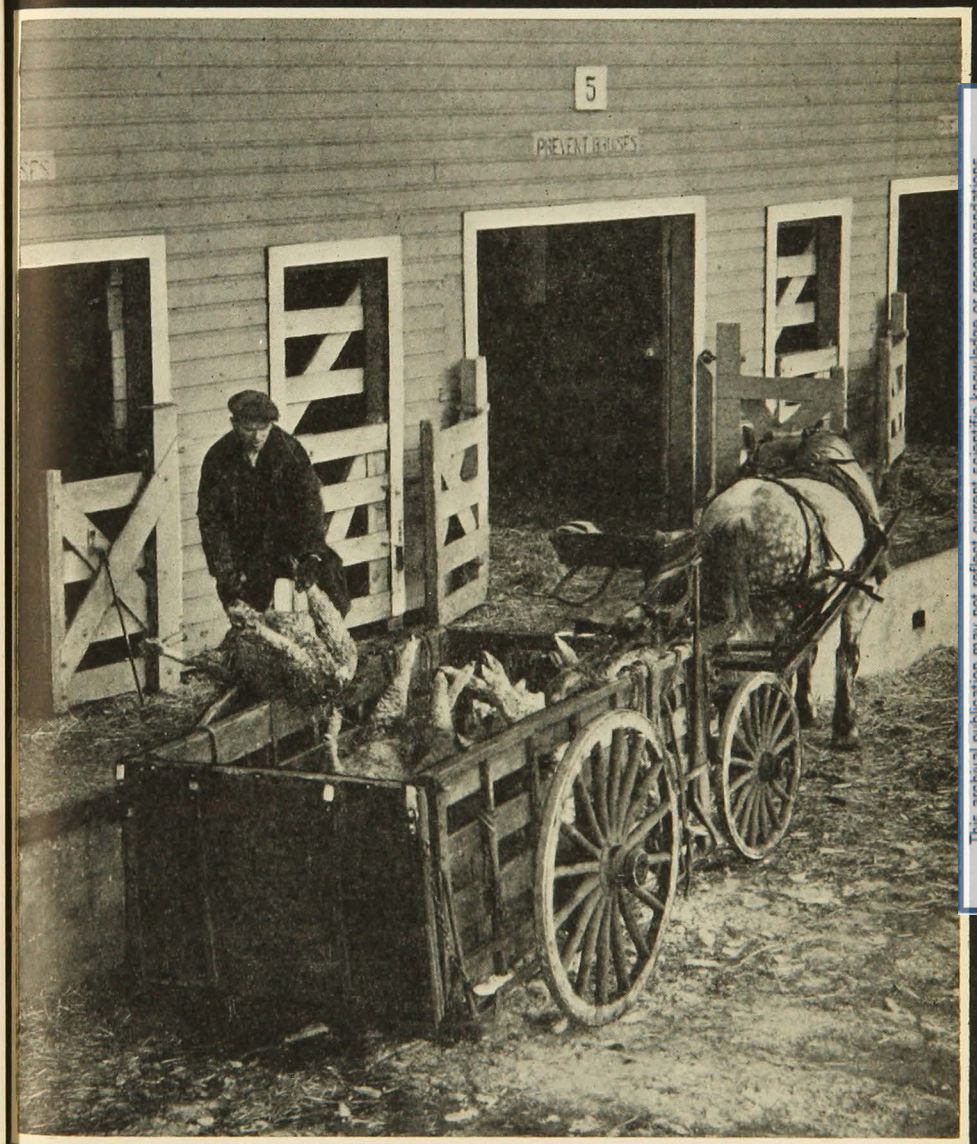
# )EATH AND CRIPPLING
# N LIVESTOCK MARKETING



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# Death and Crippling in Livestock Marketing[1]

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Losses from death and crippling that occur between the time slaughter animals are assembled for loading at the farm and the time of slaughter at a packing plant represent a part of the cost of marketing livestock. The individual producer is directly interested in these losses up to the time the actual title to the livestock changes hands. This may be at the farm, at a nearby loading point, or at a distant market. If the livestock is sold to a local dealer at the farm or at a nearby loading point, interest in these losses is merely shifted from the producer to the dealer. Likewise, the packer is directly interested in losses that occur from the time the live animals are purchased until they are slaughtered. Although transportation and market agencies do not take title to the livestock, they are interested in losses from death and crippling from a competitive standpoint. The former are interested in losses that occur en route; the latter are interested both in losses that take place en route and those that occur between the time of unloading and the time of weighing.

The extent of losses from death and crippling in the marketing of livestock in the United States is not known. However, a number of studies that throw some light on the problem have been made. One of the earliest studies was reported by the Indiana Agricultural Experiment Station in 1927 (Wiley, 1927). This study was confined to losses from death and crippling in rail shipments of hogs from local loading points to the time of unloading at the market. In 1929 the Ohio Agricultural Experiment Station reported losses from death and crippling by species and by type of transportation up to the time of unloading, and the per cent of hogs that died or were recorded as crippled in the yards (Henning, 1929). The extent of death and crippling losses by species in rail and truck shipments up to the time of unloading at South St. Paul during the year 1929 was reported in 1931 by the Minnesota Agricultural Experiment Station (Johnson and Johnson, 1931). Since these studies were made during the period when most of the livestock was transported by rail, the data apply largely to rail shipments.

More recent figures on losses from death and crippling up to the time of unloading have been reported by the National Live Stock Loss Preven-

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[2] The authors are indebted to the St. Paul Union Stock Yards Company and the South St. Paul packers for their cooperation in supplying the data upon which this study is based. Valuable assistance was also given by Mr. W. A. Peck, Regional Manager of the Northwest Live Stock Loss Prevention Board, South St. Paul. Assistance in the preparation of these materials was furnished by the personnel of Works Progress Administration Official Project No. 165-71-6999-3-400.

tion Board (Smith, 1937). That report gives the total losses for all species combined up to the time of unloading in rail shipments to 25 of of the larger public markets, and in truck shipments to 20 public markets during 1936 and 1937. Death and crippling losses in cattle shipments are also shown by type of transportation up to the time of unloading for four public markets combined during the three-year period 1935-1937 and for each of the other species during 1934 to 1937. In addition to these losses, the following statement was made with reference to losses that occur after unloading: "The Insurance Companies pay claims on at least 10 per cent more that 'go down' in the alleys after leaving the unloading docks." (Smith, 1937.) With the exception of the Ohio study which included the per cent of hogs that died or were recorded as crippled in the yards, the figures presented in these reports were confined to losses that occurred between the time of loading at the farm or at the local shipping point and the time of unloading at the market.

Individual producers are directly concerned in losses that occur up to the time the animals are weighed to the account of the buyer. Therefore, one of the objectives in the study which is reported in this bulletin was to ascertain the extent of losses from death and crippling for each species both at the time of unloading and between the time of unloading and the time of weighing. Another objective was to ascertain the extent of these losses up to the time of unloading by species, by type of transportation, and by distance zones, together with the seasonality of these losses at the South St. Paul market. Such information should be of value in determining equitable insurance rates or in reaching a decision as to the amount of reserves that should be set aside to cover losses. These data should also supply a useful statistical background to those who are interested in reducing losses from death and crippling.

## SOURCE AND SCOPE OF DATA

Figures were obtained from reports of the St. Paul Union Stock Yards Company covering total receipts and receipts by truck and by rail by species for the period 1910 through 1937. From these data it was possible to ascertain the trends that have taken place. Figures were also obtained from the St. Paul Union Stock Yards Company daily bulletin, or unloading sheets, for one full week in each month during 1936 and 1937 covering receipts by truck and by rail from each county in Minnesota, and from each state of origin for the various species.

Data were also obtained from the St. Paul Union Stock Yards Company records with respect to losses from death and crippling by species and by type of transportation up to the time of unloading for the decade 1928 through 1937. For the two-year period 1936-1937, monthly figures were obtained from the stock yards company records of the number of head, by species, that were dead or crippled upon arrival by truck and by rail, and the number that died in the yards between unloading and weighing. Monthly figures for 1936 and 1937 covering the number of

head of the different species that were recorded as crippled between the time of unloading and time of weighing were obtained from records of packer purchases of crippled animals. However, it was not possible to maintain the identity of the truck and rail shipments after the animals were unloaded, so the figures on losses from death and crippling after unloading include the combined losses in both truck and rail shipments.

Figures were also obtained from the St. Paul Union Stock Yards Company bulletin sheets covering the number of dead[3] and crippled animals by counties for Minnesota and by states for other shipments for one full week in each month during 1936 and 1937. From these data it was possible to determine the extent of the losses from dead and crippled animals for each species up to the time of unloading by type of transportation, by distance zone, for Minnesota shipments and by states for other shipments.

## EXPLANATION OF TERMS USED

**Dead animals.**—The figures on dead animals include losses (1) from point of origin to and including the time of unloading, (2) from the time of unloading to the time of weighing, and (3) the combined loss from point of origin to time of weighing. Losses from death prior to loading at the farm or local shipping point or after being weighed at the market are not included.

**Crippled animals.**—A crippled animal is defined as one that must be hauled in the "crippled cart," regardless of whether the difficulty is due to injury, emaciation, or exhaustion. The animal may either be down or in such condition that it cannot move through the yards. Animals that are lame at the time of arrival are, therefore, not recorded as being crippled as long as they are able to move out of the cars or trucks into the pens. Such animals may later go down in the yards, and if so they are then recorded as cripples. The fact that emaciated or exhausted animals are recorded as cripples is an important explanation for the relatively high per cent of crippling especially among calves after unloading. Animals that went down in the yards after they had been weighed were not included.

Not all of the losses from death and crippling of livestock are due to improper handling en route or in the yards. For example, it is a common practice among stockmen to ship emaciated and crippled animals to market as a means of salvaging them. To the extent that such animals are more likely to die en route or in the yards than normal animals, the figures on death losses do not accurately reflect the significance of such losses to the livestock industry that result from improper handling during the marketing process. Likewise, the transportation and market

[3] As a small percentage of the truckers hauled their dead animals direct to the rendering plant, it was necessary to add such deliveries to the figures obtained from the St. Paul Union Stock Yards Company bulletin sheets. Rendering plant data were sufficiently complete in most cases so that this correction could be made. However, in a few cases, the source of the shipments could not be traced, and these were omitted from the data.

**Table 1. Truck, Rail, and Total Livestock Receipts by Species, South St. Paul, 1910-1937***

| Year | Cattle | | | Calves | | | Hogs | | | Sheep | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Truck | Rail | Total cattle | Truck | Rail | Total calves | Truck | Rail | Total hogs | Truck | Rail | Total sheep |
| | 1000 head | 1000 head | 1000 head | 1000 head | 1000 head | 1000 head | 1000 head | 1000 head | 1000 head | 1000 head | 1000 head | 1000 head |
| 1910 | 9 | 473 | 482 | 1 | 121 | 122 | 9 | 827 | 836 | 5 | 860 | 865 |
| 1911 | 8 | 404 | 412 | 1 | 125 | 126 | 10 | 901 | 911 | 4 | 708 | 712 |
| 1912 | 9 | 384 | 393 | 1 | 129 | 131 | 11 | 973 | 984 | 4 | 624 | 628 |
| 1913 | 8 | 408 | 416 | 1 | 115 | 116 | 10 | 1,246 | 1,257 | 3 | 783 | 785 |
| 1914 | 8 | 460 | 468 | 2 | 116 | 117 | 13 | 1,577 | 1,590 | 2 | 793 | 795 |
| 1915 | 10 | 703 | 713 | 2 | 141 | 143 | 17 | 2,138 | 2,155 | 2 | 702 | 704 |
| 1916 | 10 | 747 | 757 | 3 | 182 | 184 | 23 | 2,652 | 2,675 | 3 | 621 | 623 |
| 1917 | 11 | 971 | 982 | 4 | 211 | 215 | 19 | 1,909 | 1,928 | 1 | 428 | 430 |
| 1918 | 13 | 1,149 | 1,162 | 6 | 263 | 269 | 23 | 2,039 | 2,061 | 2 | 628 | 630 |
| 1919 | 17 | 1,153 | 1,170 | 7 | 314 | 321 | 27 | 2,163 | 2,190 | 4 | 908 | 912 |
| 1920 | 18 | 969 | 987 | 10 | 377 | 386 | 35 | 2,212 | 2,247 | 3 | 726 | 729 |
| 1921 | 18 | 605 | 624 | 12 | 350 | 361 | 42 | 2,167 | 2,210 | 5 | 627 | 633 |
| 1922 | 24 | 906 | 930 | 22 | 435 | 457 | 65 | 2,458 | 2,523 | 10 | 489 | 499 |
| 1923 | 28 | 811 | 839 | 33 | 477 | 510 | 122 | 3,216 | 3,338 | 12 | 442 | 454 |
| 1924 | 34 | 756 | 790 | 48 | 486 | 534 | 151 | 3,601 | 3,751 | 22 | 454 | 476 |
| 1925 | 51 | 944 | 955 | 77 | 565 | 641 | 219 | 3,418 | 3,637 | 30 | 515 | 545 |
| 1926 | 75 | 1,105 | 1,180 | 105 | 625 | 730 | 294 | 3,156 | 3,451 | 45 | 728 | 773 |
| 1927 | 78 | 878 | 995 | 109 | 518 | 627 | 354 | 2,751 | 3,105 | 57 | 648 | 705 |
| 1928 | 115 | 802 | 917 | 143 | 429 | 573 | 423 | 2,479 | 2,902 | 81 | 810 | 891 |
| 1929 | 126 | 753 | 879 | 181 | 365 | 546 | 489 | 2,380 | 2,869 | 113 | 1,026 | 1,139 |
| 1930 | 160 | 619 | 779 | 255 | 305 | 559 | 733 | 2,026 | 2,759 | 162 | 1,192 | 1,354 |
| 1931 | 241 | 570 | 811 | 360 | 243 | 603 | 1,362 | 1,889 | 3,251 | 281 | 1,409 | 1,690 |
| 1932 | 280 | 410 | 690 | 361 | 183 | 544 | 1,363 | 1,237 | 2,600 | 318 | 1,205 | 1,522 |
| 1933 | 400 | 435 | 835 | 373 | 142 | 515 | 1,627 | 1,115 | 2,742 | 353 | 1,199 | 1,552 |
| 1934 | 510 | 966 | 1,476 | 445 | 395 | 840 | 1,432 | 453 | 1,885 | 381 | 1,203 | 1,584 |
| 1935 | 455 | 456 | 911 | 370 | 108 | 477 | 788 | 143 | 931 | 418 | 944 | 1,362 |
| 1936 | 545 | 562 | 1,106 | 403 | 158 | 561 | 1,634 | 361 | 1,995 | 477 | 1,011 | 1,487 |
| 1937 | 531 | 399 | 930 | 480 | 117 | 596 | 1,324 | 267 | 1,591 | 536 | 754 | 1,290 |

* Source: St. Paul Union Stock Yards Company—Livestock Report, 1937.

agencies are not responsible for crippling that occurs prior to loading at the farm. From the available data, it was not possible to ascertain the proportion of dead and crippled animals that were weak, emaciated, or crippled prior to loading at the farm. Consequently, the figures on death and crippling serve to indicate the magnitude of these losses rather than the specific cause.

## THE TREND IN LIVESTOCK RECEIPTS

The livestock receipts by species at South St. Paul for the period 1910 to 1937 are shown in table 1. Cattle receipts more than doubled between 1910 and 1917. Following 1917, numbers fluctuated greatly, largely because of variations in production, but there appears to have been no definite change in the trend. Yearly receipts from 1935 through 1937 averaged approximately one million head, which was only slightly below the average for the period 1917 to 1920. The sharp increase in receipts of cattle in 1934 was due to the federal government's cattle-buying program which followed the severe drouth that extended over much of the territory served by this market.

Calf receipts likewise almost doubled from 1910 to 1917, the trend continuing upward to over one-half million head in 1924. The increase in calf receipts was a direct result of the expansion of the dairy industry in the territory served by this market. Since 1924 there has been no marked change in numbers. During recent years receipts have averaged slightly over one-half million head except for the heavy liquidation that occurred in 1934 as a result of the drouth.

Hog receipts at South St. Paul from 1910 to 1924 followed much the same pattern as that of calves. Numbers doubled between 1910 and 1917, and continued to increase to a peak of three and three-fourths million head in 1924. Since 1924, however, the trend has been definitely downward. Receipts declined by approximately one million head between 1924 and 1933. The sharp drop in receipts since 1933 was due in part to the continued drouth which greatly reduced hog numbers throughout the territory served by this market and in part to the various federal programs aimed at reduction in output.

In contrast to the situation with respect to other species, the trend in receipts of sheep and lambs was downward from 1910 to 1917. Numbers declined from eight hundred thousand to about four hundred thousand head during this period. Following 1917, however, the trend was definitely upward through 1931 when receipts totaled approximately one and two-thirds million head. This steady increase was due in part to the increase in sheep production in the immediate territory of the market, and in part to an increase in lamb receipts from the western range.

The trend in combined receipts of all species at South St. Paul from 1910 through 1937 is shown in figure 1. The trend was definitely upward during the first half of this period. In 1923, receipts for the first time in the history of the market exceeded five million head. From 1923 to 1933 numbers averaged about five and one-half million head, with no

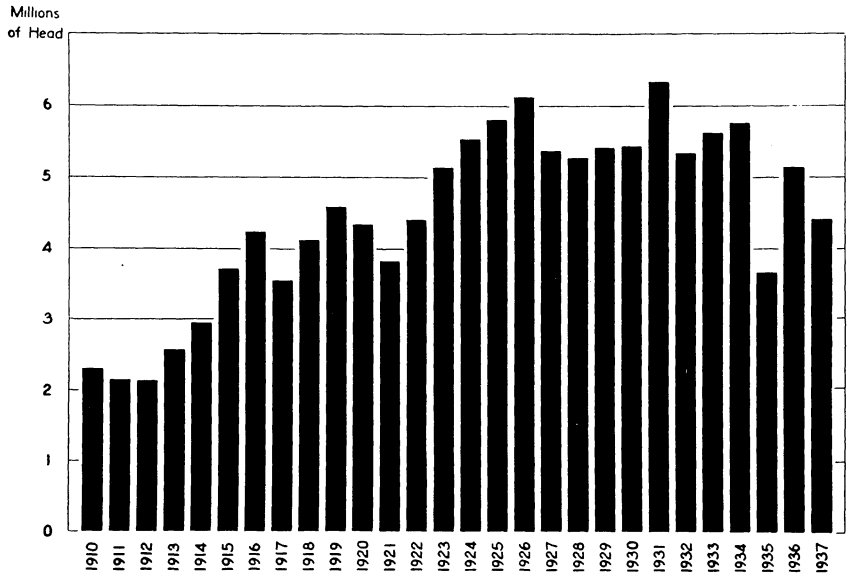


FIG. 1. THE COMBINED RECEIPTS OF CATTLE, CALVES, HOGS, AND SHEEP AND LAMBS, SOUTH ST. PAUL, 1910-1937

(Data from Saint Paul Union Stock Yards Company Livestock Report, 1937)

evident upward or downward trend. Since 1933 the trend in total receipts has been influenced by the prolonged drouth, by the opening of a new public market at West Fargo, North Dakota, on October 1, 1935,[4] and by the growth of direct marketing.

## Proportion of Livestock Transported by Truck and by Rail

As shown in table 2, a comparatively small proportion of the livestock receipts at South St. Paul was delivered by wagon or truck from 1910 to 1920. During 1920 only 1.8 per cent of the cattle, 2.5 per cent of the calves, 1.6 per cent of the hogs, and 0.4 per cent of the sheep and lambs were reported as driven-in receipts. Following 1920, however, truck receipts increased gradually until about 1928 and thereafter increased more rapidly. During 1937 over 57 per cent of the cattle, 80 per cent of the calves, 83 per cent of the hogs, and 42 per cent of the sheep and lambs were delivered by truck. Whereas only 1.5 per cent of all livestock receipts except horses arrived by truck in 1920, over 65 per cent were delivered by truck in 1937. The trend toward truck transportation has resulted from the extension of hard-surfaced, all-weather roads, and improvements in the efficiency and dependability of motor trucks.

## Source of Receipts by States

The source of receipts of the different species of livestock by states is shown in table 3. Minnesota supplied approximately one half of the cattle during both years. North Dakota ranked second with less than

[4] The yards are operated by the Union Stock Yards Company of Fargo.

one fifth of the total, Montana third, Canada fourth, Wisconsin fifth, South Dakota sixth, and Iowa seventh. Occasional shipments of cattle were also made from Washington, Nebraska, Idaho, Michigan, and Wyoming.

Approximately two thirds of the calf receipts in 1936 and a slightly higher proportion in 1937 came from Minnesota. Wisconsin ranked second with about one seventh of the total, North Dakota third, and Montana fourth. A few calves were also received from South Dakota, Canada, Iowa, and Idaho.

A higher proportion of the total hog receipts came from Minnesota than any of the other species. Minnesota supplied 83 per cent of the hogs in 1936 and about 88 per cent in 1937. Wisconsin ranked second during these two years with 8 per cent and 7 per cent, respectively, and North Dakota third. Shipments were also received from South Dakota, Montana, Canada, and Iowa.

**Table 2. Distribution of the Receipts of the Various Species of Livestock by Type of Transportation, South St. Paul, 1910-1937***

| Year | Cattle | | Calves | | Hogs | | Sheep | |
|---|---|---|---|---|---|---|---|---|
| | Truck | Rail | Truck | Rail | Truck | Rail | Truck | Rail |
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| 1910 | 1.8 | 98.2 | 0.8 | 99.2 | 1.1 | 98.9 | 0.6 | 99.4 |
| 1911 | 2.0 | 98.0 | 0.9 | 99.1 | 1.1 | 98.9 | 0.6 | 99.4 |
| 1912 | 2.2 | 97.8 | 1.0 | 99.0 | 1.1 | 98.9 | 0.7 | 99.3 |
| 1913 | 1.9 | 98.1 | 1.2 | 98.8 | 0.8 | 99.2 | 0.4 | 99.6 |
| 1914 | 1.7 | 98.3 | 1.5 | 98.5 | 0.8 | 99.2 | 0.2 | 99.8 |
| 1915 | 1.4 | 98.6 | 1.5 | 98.5 | 0.8 | 99.2 | 0.3 | 99.7 |
| 1916 | 1.3 | 98.7 | 1.6 | 98.5 | 0.8 | 99.2 | 0.4 | 99.6 |
| 1917 | 1.1 | 98.9 | 1.7 | 98.3 | 1.0 | 99.0 | 0.3 | 99.7 |
| 1918 | 1.1 | 98.9 | 2.2 | 97.8 | 1.1 | 98.9 | 0.3 | 99.7 |
| 1919 | 1.5 | 98.5 | 2.2 | 97.8 | 1.2 | 98.8 | 0.4 | 99.6 |
| 1920 | 1.8 | 98.2 | 2.5 | 97.5 | 1.6 | 98.4 | 0.4 | 99.6 |
| 1921 | 2.9 | 97.1 | 3.2 | 96.8 | 1.9 | 98.1 | 0.9 | 99.1 |
| 1922 | 2.6 | 97.4 | 4.7 | 95.3 | 2.6 | 97.4 | 2.1 | 97.9 |
| 1923 | 3.4 | 96.6 | 6.5 | 93.5 | 3.7 | 96.3 | 2.7 | 97.3 |
| 1924 | 4.3 | 95.7 | 9.0 | 91.0 | 4.0 | 96.0 | 4.5 | 95.5 |
| 1925 | 5.1 | 94.9 | 11.9 | 88.1 | 6.0 | 94.0 | 5.5 | 94.5 |
| 1926 | 6.4 | 93.6 | 14.4 | 85.6 | 8.5 | 91.5 | 5.8 | 94.2 |
| 1927 | 8.1 | 91.9 | 17.3 | 82.7 | 11.4 | 88.6 | 8.1 | 91.9 |
| 1928 | 12.5 | 87.5 | 25.0 | 75.0 | 14.6 | 85.4 | 9.1 | 90.9 |
| 1929 | 14.3 | 85.7 | 33.2 | 66.8 | 17.0 | 83.0 | 9.9 | 90.1 |
| 1930 | 20.6 | 79.4 | 45.5 | 54.5 | 26.6 | 73.4 | 12.0 | 88.0 |
| 1931 | 29.7 | 70.3 | 59.7 | 40.3 | 41.9 | 58.1 | 16.6 | 83.4 |
| 1932 | 40.6 | 59.4 | 66.3 | 33.7 | 52.4 | 47.6 | 20.9 | 79.1 |
| 1933 | 47.9 | 52.1 | 72.4 | 27.6 | 59.3 | 40.7 | 22.7 | 77.3 |
| 1934 | 34.6 | 65.4 | 53.0 | 47.0 | 76.0 | 24.0 | 24.1 | 75.9 |
| 1935 | 49.9 | 50.1 | 77.5 | 22.5 | 84.6 | 15.4 | 30.7 | 69.3 |
| 1936 | 49.2 | 50.8 | 71.8 | 28.2 | 81.9 | 18.1 | 32.1 | 67.9 |
| 1937 | 57.1 | 42.9 | 80.4 | 19.6 | 83.2 | 16.8 | 41.5 | 58.5 |

* Source: St. Paul Union Stock Yards Company, Livestock Report, 1937.

Table 3. Distribution of the Truck and Rail Receipts of the Various Species of Livestock by State of Origin, South St. Paul, 1936-1937*

| State | Cattle | | | Calves | | | Hogs | | | Sheep | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rail | Truck | Total | Rail | Truck | Total | Rail | Truck | Total | Rail | Truck | Total |
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| 1936 | | | | | | | | | | | | |
| Minnesota | 15.2 | 84.6 | 49.4 | 34.7 | 79.2 | 66.2 | 53.2 | 89.0 | 82.8 | 15.0 | 88.1 | 38.3 |
| North Dakota | 36.6 | 1.9 | 19.5 | 35.1 | 0.5 | 10.6 | 31.6 | 0.7 | 6.1 | 23.2 | 1.4 | 16.3 |
| Montana | 30.9 | 0.2 | 15.8 | 22.9 | 0.1 | 6.8 | 2.0 | 0.0 | 0.4 | 43.3 | ..... | 29.6 |
| Canada | 11.1 | ..... | 5.6 | 1.6 | ..... | 0.5 | 0.9 | ..... | 0.2 | ..... | ..... | ..... |
| South Dakota | 4.7 | 1.5 | 3.1 | 4.4 | 0.5 | 1.6 | 11.3 | 1.1 | 2.8 | 2.5 | 0.6 | 1.9 |
| Wisconsin | 0.4 | 9.5 | 4.9 | 1.3 | 19.5 | 14.2 | 1.4 | 8.9 | 7.6 | 0.4 | 9.5 | 3.3 |
| Washington | 0.3 | ..... | 0.2 | ..... | ..... | ..... | ..... | ..... | ..... | 11.9 | ..... | 8.1 |
| Idaho | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3.1 | ..... | 2.1 |
| Iowa | 0.5 | 2.2 | 1.4 | 0.1 | 0.3 | 0.2 | 0.0 | 0.2 | 0.2 | 0.0 | 0.4 | 0.1 |
| Other states | 0.2 | 0.0 | 0.1 | ..... | ..... | ..... | ..... | ..... | ..... | 0.6 | ..... | 0.4 |
| 1937 | | | | | | | | | | | | |
| Minnesota | 17.6 | 82.0 | 54.1 | 45.8 | 79.1 | 72.8 | 73.1 | 90.3 | 87.6 | 19.0 | 89.3 | 49.5 |
| North Dakota | 35.2 | 3.5 | 17.2 | 28.8 | 1.3 | 6.5 | 18.9 | 0.7 | 3.6 | 23.0 | 1.6 | 13.7 |
| Montana | 24.6 | 0.0 | 10.7 | 13.8 | 0.0 | 2.6 | 0.7 | 0.0 | 0.1 | 34.2 | 0.0 | 19.3 |
| Canada | 17.5 | ..... | 7.6 | 7.9 | ..... | 1.5 | 2.7 | ..... | 0.4 | ..... | ..... | ..... |
| South Dakota | 3.6 | 1.4 | 2.3 | 2.0 | 0.5 | 0.8 | 2.8 | 0.4 | 0.7 | 1.7 | 0.7 | 1.3 |
| Wisconsin | 0.7 | 10.4 | 6.2 | 1.6 | 18.9 | 15.7 | 1.8 | 8.3 | 7.3 | 0.1 | 7.9 | 3.5 |
| Washington | 0.3 | ..... | 0.2 | ..... | ..... | ..... | ..... | ..... | ..... | 13.5 | ..... | 7.7 |
| Idaho | 0.1 | ..... | 0.1 | 0.0 | ..... | 0.0 | ..... | ..... | ..... | 5.6 | ..... | 3.2 |
| Iowa | 0.4 | 2.7 | 1.7 | 0.0 | 0.2 | 0.2 | 0.1 | 0.3 | 0.3 | ..... | 0.5 | 0.2 |
| Other states | 0.1 | 0.1 | 0.0 | ..... | ..... | ..... | ..... | ..... | ..... | 3.0 | ..... | 1.7 |

* Source: St. Paul Union Stock Yards Company bulletin sheets. Data based upon receipts during one full week in each month during 1936 and 1937.

Minnesota supplied a smaller proportion of the total sheep and lamb receipts than of any other species. In 1936 Minnesota shipments amounted to approximately two fifths of the total and in 1937 slightly less than one half. Montana was second in importance as a source of supplies, with North Dakota third. Receipts also included some shipments from Washington, Wisconsin, Idaho, South Dakota, Texas, Iowa, Oregon, California, Nebraska, and Colorado.

The proportion of total truck and rail receipts supplied by the different states is also shown in table 3. The actual number of head shipped from each state by each type of transportation may be obtained by relating these figures to the total receipts arriving by rail and truck as shown for 1936 and 1937 in table 1. The greater proportion of the shipments from Minnesota and Wisconsin arrived by truck. The same was true of the relatively small receipts from Iowa. On the other hand, rail shipments greatly exceeded truck shipments from North Dakota, Montana, South Dakota, Michigan, and Wyoming. All shipments from Canada, Washington, Idaho, Texas, Oregon, California, Colorado, and Nebraska were by rail.

## RECEIPTS OF MINNESOTA LIVESTOCK BY DISTANCE ZONES

The per cent of Minnesota livestock marketed at South St. Paul from various distance zones is shown in table 4.[5] Over 88 per cent of the cattle marketed from Minnesota farms at South St. Paul came from within a radius of 175 miles. About two thirds of the cattle were shipped from within a radius of 125 miles and about one half from 100 miles and under. A higher proportion of calves than of cattle came from within the 175-mile radius—90 per cent of total Minnesota shipments to that market in 1936 and 91 per cent in 1937. Approximately two thirds of the calves came from within 100 miles, and nearly one half from within 75 miles. A still greater proportion of the hogs came from within the 175-mile radius, 96 per cent having been supplied from within this area in 1936 and nearly 98 per cent in 1937. Almost two thirds of the hogs were shipped from within a radius of 100 miles. On the other hand, only about three fourths of the sheep and lambs came from within a radius of 175 miles of the market, and about one half from within 125 miles.

With respect to type of transportation, the highest proportion of rail receipts of all species except sheep and lambs shipped from Minnesota to South St. Paul came from within the 151–175-mile zone. Slightly more than one third of the hogs and about one fourth of the cattle and calves arriving by rail from Minnesota came from this zone. About one third of the sheep and lambs arriving by rail from Minnesota came a distance greater than 275 miles, and slightly less than one third from the

[5] Owing to the fact that the distance by rail from a given point of origin to South St. Paul usually differs from the distance by truck, and since truck mileage changes from time to time as new highways are constructed, the distance zones were established by concentric circles radiating from South St. Paul. For example, the 25-mile zone includes the area within a 25-mile radius of the market. Each county was then placed in the zone which included the greater part of the land area of that particular county.

**Table 4. Distribution of the Truck and Rail Receipts of the Various Species of Livestock According to Distance Shipped, South St. Paul, 1936-1937***

| Distance of shipment in miles | Cattle | | | Calves | | | Hogs | | | Sheep | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rail | Truck | Total | Rail | Truck | Total | Rail | Truck | Total | Rail | Truck | Total |
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| 1936 | | | | | | | | | | | | |
| 0- 25 | 0.0 | 6.1 | 5.2 | 0.0 | 8.9 | 7.5 | 0.1 | 4.4 | 3.9 | 0.0 | 7.5 | 5.5 |
| 26- 50 | 0.3 | 10.7 | 9.1 | 0.9 | 25.0 | 21.3 | 1.1 | 16.4 | 14.7 | 0.0 | 6.1 | 4.5 |
| 51- 75 | 2.3 | 14.9 | 12.9 | 3.7 | 19.2 | 16.8 | 4.5 | 22.4 | 20.4 | 0.4 | 15.3 | 11.3 |
| 76-100 | 12.6 | 21.8 | 20.4 | 11.0 | 20.0 | 18.6 | 14.8 | 23.1 | 22.2 | 3.6 | 17.0 | 13.4 |
| 101-125 | 11.5 | 18.2 | 17.2 | 17.0 | 8.8 | 10.1 | 15.9 | 14.4 | 14.6 | 5.8 | 15.6 | 13.0 |
| 126-150 | 9.4 | 10.8 | 10.6 | 9.5 | 4.3 | 5.1 | 14.2 | 9.4 | 9.9 | 5.5 | 12.8 | 10.9 |
| 151-175 | 27.5 | 10.5 | 13.1 | 24.8 | 8.2 | 10.8 | 33.6 | 7.4 | 10.3 | 25.0 | 12.3 | 15.7 |
| 176-200 | 5.0 | 2.6 | 2.9 | 3.4 | 1.5 | 1.8 | 4.3 | 1.5 | 1.8 | 1.9 | 2.1 | 2.0 |
| 201-225 | 2.9 | 1.5 | 1.7 | 4.2 | 1.5 | 1.9 | 2.1 | 0.4 | 1.0 | 8.0 | 3.1 | 4.5 |
| 226-250 | 1.6 | 0.2 | 0.4 | 1.4 | 0.1 | 0.3 | 0.7 | 0.1 | 0.1 | 0.7 | 0.3 | 0.4 |
| 251-275 | 8.9 | 1.9 | 3.0 | 8.3 | 1.6 | 2.6 | 4.0 | 0.4 | 0.8 | 14.3 | 3.9 | 6.9 |
| 276 and over | 18.1 | 0.8 | 3.5 | 15.9 | 0.9 | 3.2 | 4.9 | 0.1 | 0.7 | 34.8 | 4.0 | 12.2 |
| 1937 | | | | | | | | | | | | |
| 0- 25 | 0.0 | 6.6 | 5.6 | 0.0 | 8.9 | 7.9 | 0.0 | 5.3 | 4.6 | 0.0 | 6.7 | 5.2 |
| 26- 50 | 0.6 | 12.9 | 11.2 | 1.1 | 25.8 | 22.9 | 1.3 | 18.8 | 16.5 | 0.1 | 5.6 | 4.4 |
| 51- 75 | 3.7 | 17.2 | 15.3 | 5.4 | 19.5 | 17.8 | 3.6 | 24.8 | 22.0 | 0.8 | 14.5 | 11.5 |
| 76-100 | 18.0 | 21.5 | 21.0 | 14.0 | 19.3 | 18.7 | 18.5 | 22.3 | 21.8 | 5.7 | 18.7 | 15.6 |
| 101-125 | 12.0 | 15.8 | 15.3 | 17.2 | 8.5 | 9.5 | 12.0 | 13.4 | 13.2 | 3.0 | 17.3 | 14.2 |
| 126-150 | 7.4 | 9.9 | 9.6 | 9.2 | 4.0 | 4.7 | 23.5 | 7.4 | 9.5 | 6.1 | 12.9 | 11.5 |
| 151-175 | 25.0 | 8.7 | 11.0 | 25.3 | 7.7 | 9.8 | 35.1 | 6.1 | 9.9 | 32.5 | 10.7 | 15.5 |
| 176-200 | 3.5 | 2.0 | 2.2 | 3.1 | 1.6 | 1.8 | 1.4 | 1.0 | 1.0 | 2.0 | 2.6 | 2.4 |
| 201-225 | 4.0 | 1.7 | 2.0 | 4.7 | 1.7 | 2.0 | 0.7 | 0.3 | 0.3 | 7.4 | 3.2 | 4.1 |
| 226-250 | 2.4 | 0.1 | 0.5 | 1.4 | 0.0 | 0.2 | 0.3 | 0.0 | 0.1 | 1.4 | 0.3 | 0.5 |
| 251-275 | 8.4 | 2.3 | 3.1 | 7.0 | 1.8 | 2.4 | 1.5 | 0.5 | 0.6 | 9.3 | 2.7 | 4.2 |
| 276 and over | 15.0 | 1.3 | 3.2 | 11.7 | 1.1 | 2.4 | 2.1 | 0.2 | 0.4 | 31.8 | 4.7 | 10.6 |

* Source: St. Paul Union Stock Yards Company bulletin sheets. Data based upon receipts for one full week in each month during 1936-1937.

151–175-mile zone. The highest proportion of truck receipts of cattle, sheep, and lambs from Minnesota came from within the 76–100-mile zone, while the 51–75- and 76–100-mile zones each supplied over one fifth of the hogs and nearly one fifth of the calves.

## LOSSES FROM DEATH AND CRIPPLING

### Death Losses Up to the Time of Unloading

Table 5 shows the per cent of livestock death losses up to the time of unloading at South St. Paul by species and by type of transportation for the ten-year period 1928-1937. There appears to have been no noticeable change in the per cent of death losses in rail shipments of cattle during this ten-year period. However, the per cent of death losses in truck shipments increased.[6] During the early part of this period the per cent of death losses was about the same for each type of transportation, but during recent years losses by truck have been about twice as high as by rail. This together with the fact that truck receipts increased relative to rail receipts resulted in a slight upward trend in the per cent of total death losses of cattle.

The trend in the per cent of death losses in rail shipments of calves was downward during this period, while the trend was definitely upward in truck shipments. However, losses in rail shipments were higher than in truck shipments throughout this period. Because of the marked shift from rail to truck transportation, and because rail losses of calves were nearly four times as high as truck losses in 1928 and 1929, the trend in combined losses was downward.

During the early part of the 1928-1937 period, the per cent of death losses among hogs shipped by rail was higher than in truck shipments. However, the percentage of losses by rail declined slightly, while that by truck increased. As a result, the per cent of losses during 1936 and 1937 was about the same for each type of transportation. When the death losses are combined, there appears to have been no noticeable change in losses during this ten-year period.

The decline in the per cent of death losses of sheep and lambs shipped by rail was greater than with any of the other species. Likewise, the increase in the per cent of losses in truck shipments was more pronounced, being more than twice as high in 1936 and 1937 as calf losses, over three times as high as hog losses, and over six times as high as cattle losses. The decline in rail losses and the increase in truck losses resulted in a slight downward trend in combined losses from 1928 through 1934 followed by an upward trend through 1937.

The trend in the per cent of death losses in rail shipments of sheep and lambs was, therefore, sharply downward from 1928 to 1937, slightly downward in calves and hogs, with very little change in cattle. On the

[6] This is explained by the fact that the trucking area increased greatly during this period, and, as shown in a later section of this bulletin, death losses in truck shipments of cattle increased with distance within a radius of 200 miles of the market.

**Table 5. Percentage of Death Losses for the Various Species of Livestock Received by Truck and by Rail, South St. Paul, 1928-1937***

| Year | Cattle | | | Calves | | | Hogs | | | Sheep and Lambs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Truck† | Rail‡ | Total§ | Truck | Rail | Total | Truck | Rail | Total | Truck | Rail | Total |
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| 1928 | .034 | .031 | .032 | .072 | .356 | .285 | .071 | .111 | .106 | .025 | .197 | .181 |
| 1929 | .033 | .030 | .030 | .066 | .330 | .242 | .062 | .167 | .149 | .081 | .175 | .166 |
| 1930 | .032 | .039 | .038 | .072 | .394 | .248 | .075 | .149 | .130 | .148 | .152 | .151 |
| 1931 | .031 | .029 | .030 | .069 | .326 | .173 | .083 | .123 | .106 | .176 | .155 | .159 |
| 1932 | .038 | .022 | .028 | .082 | .271 | .146 | .099 | .113 | .106 | .221 | .140 | .157 |
| 1933 | .041 | .024 | .032 | .104 | .246 | .143 | .118 | .112 | .116 | .220 | .129 | .150 |
| 1934 | .042 | .049 | .047 | .132 | .210 | .169 | .096 | .113 | .100 | .229 | .109 | .138 |
| 1935 | .058 | .034 | .046 | .145 | .314 | .183 | .099 | .120 | .102 | .295 | .098 | .158 |
| 1936 | .045 | .029 | .037 | .194 | .307 | .226 | .117 | .111 | .116 | .372 | .079 | .173 |
| 1937 | .062 | .029 | .047 | .169 | .254 | .186 | .103 | .088 | .101 | .356 | .106 | .210 |

* Source: St. Paul Union Stock Yards Company records. Losses are those occurring up to the time of and during unloading at the unloading docks.
† Per cent of total truck receipts of the different species. For example, .034 per cent equals .34 per 1000 head.
‡ Per cent of total rail receipts of the different species. § Per cent of total truck and rail receipts of the different species.

**Table 6. Percentage of Crippled Losses for the Various Species of Livestock Received by Truck and Rail, South St. Paul, 1928-1937***

| Year | Cattle | | | Calves | | | Hogs | | | Sheep and Lambs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Truck† | Rail‡ | Total§ | Truck | Rail | Total | Truck | Rail | Total | Truck | Rail | Total |
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| 1928 | .230 | .090 | .108 | .029 | .095 | .078 | .094 | .251 | .228 | .011 | .073 | .067 |
| 1929 | .240 | .077 | .100 | .024 | .098 | .073 | .149 | .290 | .266 | .034 | .078 | .073 |
| 1930 | .239 | .078 | .111 | .022 | .086 | .057 | .163 | .332 | .287 | .082 | .052 | .055 |
| 1931 | .179 | .058 | .094 | .017 | .051 | .031 | .147 | .252 | .208 | .043 | .057 | .055 |
| 1932 | .140 | .058 | .091 | .017 | .119 | .040 | .200 | .271 | .234 | .008 | .055 | .045 |
| 1933 | .133 | .052 | .091 | .024 | .091 | .043 | .261 | .186 | .230 | .007 | .065 | .052 |
| 1934 | .129 | .090 | .103 | .026 | .151 | .085 | .222 | .229 | .223 | .009 | .052 | .042 |
| 1935 | .176 | .056 | .116 | .045 | .157 | .071 | .284 | .299 | .287 | .037 | .040 | .039 |
| 1936 | .122 | .041 | .081 | .057 | .111 | .072 | .307 | .210 | .289 | .065 | .049 | .054 |
| 1937 | .139 | .032 | .093 | .063 | .173 | .082 | .274 | .379 | .292 | .082 | .048 | .062 |

* Source: St. Paul Union Stock Yards Company records. Losses are those occurring up to the time of and during unloading at the unloading docks.
† Per cent of total truck receipts of the different species. For example, .230 per cent equals 2.3 animals per 1000 head.
‡ Per cent of total rail receipts of the different species. § Per cent of total truck and rail receipts of the different species.

other hand, the trend in the per cent of death losses in truck shipments was sharply upward in the case of sheep and lambs, less sharply but definitely upward in cattle and calves, and slightly upward in hogs. When losses by both types of transportation are combined, the trend was downward in the case of calves, about constant in hogs, and upward in cattle. It was downward from 1928 to 1934 in the case of sheep and lambs, but upward during the following three years.

## Crippled Losses Up to the Time of Unloading

More than twice as many cattle and nearly three times as many hogs reached the market in a crippled condition during 1936 and 1937 as arrived dead. The number of crippled calves was considerably less than one half of the number of dead calves, and the number of crippled sheep and lambs was less than one third the number that were dead upon arrival. As shown in table 6, the trend in the per cent of crippled cattle was sharply downward from 1928 to 1937 in the case of each type of transportation. However, since the per cent of crippled cattle in truck shipments was much greater than in rail shipments and since the proportion of cattle arriving by truck increased greatly, there was no noticeable change in the per cent of crippled cattle when losses from both types of transportation are combined.

On the other hand, there was an upward trend in the per cent of crippled calves that arrived both by truck and rail. Throughout this ten-year period the per cent of crippled calves in rail shipments was much higher than in truck shipments. Owing to the sharp increase in the proportion of calves arriving by truck, the per cent of total crippled calves was about the same during 1936 and 1937 as in 1928 and 1929.

The trend in per cent of crippled hogs in truck shipments was sharply upward during this ten-year period, while there appears to have been no definite change in the percentage of crippled hogs arriving by rail. The increase in proportion of hogs arriving by truck together with the increase in per cent of crippled hogs in such shipments resulted in a slight upward trend in the combined total per cent of crippled animals.

The per cent of crippled sheep and lambs arriving by truck likewise increased during this ten-year period, but the trend in per cent of crippled sheep and lambs arriving by rail declined. When losses from both types of transportation are combined, the trend was downward through 1935 followed by an upward trend through 1937. The extent of total crippling losses among sheep and lambs was slightly less than among cattle and calves, and only about one fourth that of hogs.

## Death Losses Up to the Time of Weighing

Total death losses up to the time of weighing at the South St. Paul market for 1936 and 1937 are shown in table 7. Approximately 60 per cent of the death losses of cattle occurred up to the time of unloading, and about 40 per cent between the time of unloading and the time of

**Table 7. Total Marketing Death Losses for the Various Species of Livestock Received, South St. Paul, 1936 and 1937***

| Species | Number of Dead Animals | | | Percentage of Total Dead Animals | | Percentage of Total Receipts | | |
|---|---|---|---|---|---|---|---|---|
| | To unloading | After unloading† | Total | To unloading | After unloading | To unloading | After unloading | Total |
| | number | number | number | per cent | per cent | per cent | per cent | per cent |
| Cattle | | | | | | | | |
| 1936 | 409 | 286 | 695 | 58.8 | 41.2 | .037 | .026 | .063 |
| 1937 | 446 | 283 | 730 | 61.2 | 38.8 | .047 | .030 | .078 |
| Calves | | | | | | | | |
| 1936 | 1,267 | 652 | 1,919 | 66.0 | 34.0 | .226 | .116 | .342 |
| 1937 | 1,106 | 563 | 1,669 | 66.3 | 33.7 | .186 | .094 | .280 |
| Hogs | | | | | | | | |
| 1936 | 2,318 | 525 | 2,843 | 81.5 | 18.5 | .116 | .026 | .143 |
| 1937 | 1,599 | 419 | 2,018 | 79.2 | 20.8 | .101 | .026 | .127 |
| Sheep | | | | | | | | |
| 1936 | 2,576 | 576 | 3,152 | 81.7 | 18.3 | .173 | .039 | .212 |
| 1937 | 2,710 | 468 | 3,178 | 85.3 | 14.7 | .210 | .036 | .246 |

* Source: St. Paul Union Stock Yards Company records.
† From time of unloading to time of weighing.

weighing. In the case of calves, two thirds of the losses occurred up to the time of unloading and one third between unloading and weighing. A higher proportion of death losses among hogs and sheep and lambs occurred up to the time of unloading. About 18 per cent of the death losses among sheep and lambs occurred after unloading in 1936 and 15 per cent in 1937. Comparable figures for hogs were 18 per cent in 1936 and 21 per cent in 1937.

## Crippled Losses Up to the Time of Weighing

As shown in table 8, over two thirds of the crippled cattle were crippled before and during unloading and less than one third were recorded as crippled after unloading. On the other hand, between one half and two thirds of the crippled calves were recorded as crippled after unloading. Nearly four fifths of the crippled hogs and between two thirds and three fourths of the crippled sheep and lambs were crippled before and during unloading.

In connection with these figures on losses from crippling, attention should be called to the definition of a crippled animal as given earlier in this bulletin. Some of the animals that are lame but still able to walk out of the car or truck—hence not classed as crippled when unloaded—later reach a condition in which they are unable to walk to the scales. Weak, emaciated, or exhausted animals frequently go down in the yards or are unable to move to the scales and are hauled in the "crippled cart." This is particularly true in the case of young calves. A considerable share of the animals reported as crippled in the yards probably had suffered previous injury or were so emaciated or exhausted that it was necessary to haul them in the crippled cart.

## Seasonal Variation in Death Losses

**Cattle.**—The seasonal variations in death losses among the different species during 1936 and 1937 by rail to unloading, by truck to unloading, by rail and truck combined to unloading, by rail and truck combined from unloading to weighing, and by rail and truck combined up to the time of weighing are shown in table 9. There was considerable variation in the seasonality of death losses during 1936 and 1937 in shipments of cattle by rail up to the time of unloading. The highest per cent of death losses in 1936 occurred from October through January, while in 1937 the heaviest losses occurred from March through May and from October through January.

On the whole, death losses among cattle shipped by truck were higher up to unloading during the winter months from November through February, and with few exceptions losses were greater by truck than by rail. When the death losses of cattle shipped by rail and by truck are combined up to unloading, it is apparent that heaviest losses occurred from November through February, with the least loss from June through September. Losses during the winter months were about double the losses during the summer.

Considerable variation also occurred in death losses among cattle after unloading, but the data do not indicate a definite seasonal trend. The combined losses in both rail and truck shipments up to the time of weighing were much greater during the winter than during the summer months. Heaviest losses occurred during December, January, and February. The trend was definitely downward from February to August or September, following which losses increased greatly.

**Table 8. Total Marketing Losses from Crippling for the Various Species of Livestock Received, South St. Paul, 1936 and 1937**

| Species | Number of Crippled Animals | | | Percentage of Total Crippled Animals | | Percentage of Total Receipts | | |
|---|---|---|---|---|---|---|---|---|
| | To unloading* | After unloading† | Total | To unloading | After unloading | To unloading | After unloading | Total |
| | number | number | number | per cent | per cent | per cent | per cent | per cent |
| Cattle | | | | | | | | |
| 1936 | 896 | 409 | 1,305 | 68.7 | 31.3 | .081 | .037 | .118 |
| 1937 | 868 | 394 | 1,262 | 68.8 | 31.2 | .093 | .042 | .136 |
| Calves | | | | | | | | |
| 1936 | 404 | 632 | 1,036 | 39.0 | 61.0 | .072 | .113 | .185 |
| 1937 | 487 | 618 | 1,105 | 44.1 | 55.9 | .082 | .104 | .185 |
| Hogs | | | | | | | | |
| 1936 | 5,775 | 1,493 | 7,268 | 79.5 | 20.5 | .289 | .075 | .364 |
| 1937 | 4,644 | 1,297 | 5,941 | 78.2 | 21.8 | .292 | .082 | .374 |
| Sheep | | | | | | | | |
| 1936 | 806 | 365 | 1,171 | 68.8 | 31.2 | .054 | .025 | .079 |
| 1937 | 800 | 297 | 1,097 | 72.9 | 27.1 | .062 | .023 | .085 |

* Source: St. Paul Union Stock Yards Company records.
† Records of packer purchases of crippled animals.

Table 9. Seasonal Variation in Livestock Death Losses, South St. Paul, 1936 and 1937*

| | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| **Cattle** | | | | | | | | | | | | |
| To unloading | | | | | | | | | | | | |
| Rail—1936 | .044 | .023 | .018 | .024 | .017 | .026 | .017 | .021 | .025 | .033 | .051 | .080 |
| 1937 | .036 | .017 | .043 | .052 | .045 | .024 | .027 | .023 | .008 | .036 | .050 | .034 |
| Truck—1936 | .066 | .063 | .040 | .038 | .046 | .026 | .035 | .032 | .039 | .038 | .065 | .058 |
| 1937 | .110 | .148 | .069 | .046 | .061 | .030 | .053 | .038 | .030 | .046 | .064 | .065 |
| All shipments | | | | | | | | | | | | |
| 1936 | .059 | .051 | .033 | .031 | .036 | .026 | .025 | .025 | .029 | .035 | .058 | .064 |
| 1937 | .086 | .115 | .063 | .047 | .058 | .028 | .041 | .029 | .016 | .039 | .058 | .058 |
| After unloading | | | | | | | | | | | | |
| All shipments | | | | | | | | | | | | |
| 1936 | .036 | .024 | .036 | .024 | .019 | .017 | .036 | .018 | .022 | .024 | .030 | .034 |
| 1937 | .015 | .021 | .036 | .047 | .050 | .063 | .055 | .029 | .015 | .015 | .014 | .043 |
| Total losses | | | | | | | | | | | | |
| 1936 | .094 | .075 | .068 | .056 | .054 | .042 | .061 | .043 | .052 | .059 | .088 | .098 |
| 1937 | .101 | .138 | .099 | .095 | .107 | .091 | .095 | .057 | .031 | .054 | .072 | .102 |
| **Calves** | | | | | | | | | | | | |
| To unloading | | | | | | | | | | | | |
| Rail—1936 | .376 | .300 | .379 | .293 | .151 | .281 | .238 | .370 | .188 | .277 | .628 | .390 |
| 1937 | .378 | .225 | .186 | .204 | .160 | .257 | .336 | .266 | .218 | .316 | .205 | .301 |
| Truck—1936 | .263 | .287 | .169 | .221 | .191 | .141 | .136 | .158 | .172 | .166 | .216 | .206 |
| 1937 | .274 | .267 | .215 | .150 | .116 | .145 | .119 | .120 | .137 | .137 | .128 | .162 |
| All shipments | | | | | | | | | | | | |
| 1936 | .278 | .288 | .197 | .234 | .184 | .173 | .177 | .265 | .180 | .213 | .317 | .235 |
| 1937 | .286 | .262 | .211 | .157 | .123 | .168 | .178 | .174 | .165 | .185 | .140 | .176 |
| After unloading | | | | | | | | | | | | |
| All shipments | | | | | | | | | | | | |
| 1936 | .094 | .077 | .139 | .107 | .068 | .104 | .139 | .127 | .148 | .104 | .135 | .138 |
| 1937 | .115 | .102 | .123 | .098 | .082 | .092 | .119 | .096 | .086 | .058 | .076 | .070 |
| Total losses | | | | | | | | | | | | |
| 1936 | .372 | .365 | .336 | .341 | .252 | .277 | .315 | .392 | .327 | .317 | .452 | .372 |
| 1937 | .401 | .364 | .334 | .256 | .206 | .260 | .296 | .269 | .251 | .243 | .215 | .246 |

Table 9—(Continued)

| | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| **Hogs** | | | | | | | | | | | | |
| To unloading | | | | | | | | | | | | |
| Rail—1936 | .203 | .209 | .094 | .064 | .151 | .177 | .293 | .117 | .073 | .031 | .074 | .107 |
| 1937 | .128 | .064 | .082 | .019 | .082 | .141 | .269 | .204 | .050 | .020 | .050 | .090 |
| Truck—1936 | .164 | .217 | .143 | .110 | .180 | .110 | .125 | .098 | .064 | .082 | .106 | .114 |
| 1937 | .125 | .122 | .096 | .067 | .104 | .089 | .109 | .085 | .061 | .072 | .095 | .152 |
| All shipments | | | | | | | | | | | | |
| 1936 | .168 | .216 | .136 | .104 | .176 | .121 | .163 | .102 | .066 | .070 | .100 | .113 |
| 1937 | .126 | .114 | .094 | .060 | .101 | .098 | .140 | .103 | .059 | .062 | .086 | .140 |
| After unloading | | | | | | | | | | | | |
| All shipments | | | | | | | | | | | | |
| 1936 | .019 | .036 | .013 | .015 | .024 | .007 | .055 | .034 | .041 | .027 | .024 | .019 |
| 1937 | .036 | .035 | .026 | .022 | .018 | .018 | .027 | .054 | .052 | .020 | .025 | .014 |
| Total losses | | | | | | | | | | | | |
| 1936 | .187 | .251 | .149 | .119 | .199 | .127 | .218 | .136 | .107 | .098 | .124 | .132 |
| 1937 | .161 | .149 | .119 | .082 | .118 | .115 | .167 | .157 | .111 | .082 | .112 | .155 |
| **Sheep** | | | | | | | | | | | | |
| To unloading | | | | | | | | | | | | |
| Rail—1936 | .140 | .118 | .251 | .185 | ..... | .014 | .034 | .013 | .025 | .087 | .154 | .145 |
| 1937 | .169 | .256 | .190 | .646 | .084 | .009 | .026 | .014 | .045 | .107 | .147 | .227 |
| Truck—1936 | .637 | .674 | .699 | .364 | .284 | .172 | .271 | .302 | .184 | .300 | .366 | .399 |
| 1937 | .479 | .445 | .406 | .449 | .317 | .241 | .293 | .307 | .227 | .317 | .310 | .399 |
| All shipments | | | | | | | | | | | | |
| 1936 | .310 | .276 | .472 | .307 | .145 | .092 | .102 | .066 | .057 | .143 | .247 | .282 |
| 1937 | .338 | .373 | .322 | .516 | .204 | .118 | .102 | .066 | .099 | .183 | .227 | .319 |
| After unloading | | | | | | | | | | | | |
| All shipments | | | | | | | | | | | | |
| 1936 | .040 | .044 | .035 | .041 | .036 | .071 | .052 | .034 | .040 | .038 | .041 | .028 |
| 1937 | .031 | .038 | .054 | .098 | .123 | .054 | .026 | .032 | .038 | .035 | .030 | .033 |
| Total losses | | | | | | | | | | | | |
| 1936 | .350 | .320 | .501 | .342 | .181 | .160 | .154 | .100 | .097 | .184 | .289 | .309 |
| 1937 | .369 | .411 | .376 | .615 | .327 | .172 | .128 | .098 | .137 | .219 | .257 | .353 |

* Source: St. Paul Union Stock Yards Company records.

**Calves.**—Although variations in death losses among calves shipped by rail during 1936 and 1937 were much greater than in the case of cattle, there was less evidence of a definite seasonal trend. The least losses occurred in May and September, with a tendency for the heaviest losses to occur in December, January, July, and August. On the other hand, the trend in death losses of calves up to unloading when shipped by truck was definitely downward from the high point in January and February through the spring months. Lowest losses occurred from May through October, with heaviest losses during the winter and early spring months.

Whereas death losses of cattle when shipped by rail were less than when shipped by truck, the reverse was true in the case of calves. The proportion of dead calves in rail shipments was higher than in truck shipments. When figures for rail and truck shipments were combined, the lowest per cent of death losses among calves occurred in May, June, and July and again in September and October, with heaviest losses during January, February, August, November, and December.

Death losses among calves after unloading appeared to be higher during the winter and summer months than during the spring and fall. When the data are combined for both types of transportation up to the time of weighing, the least losses occurred in April, May, and June, and again in September and October. Heaviest losses occurred during the winter and summer months.

**Hogs.**—The per cent of death losses among hogs in rail shipments up to the time of unloading declined from January through April, advanced sharply to the highest point of the year in July, declined to slightly below the April level in October, and then advanced sharply through December. The seasonal trend in the per cent of death losses of hogs in truck shipments was downward from February to April, advanced sharply in May, declined in June, advanced again in July, declined to the low point of the year during September, and then advanced from October through January.

The fluctuations in death losses were much greater in rail than in truck shipments. Rail losses in July were the highest of the year for either type of transportation and in October they were the lowest. Truck losses were slightly higher than rail losses from October through May, while rail losses were higher from June through August. Rail losses were more than twice as high as truck losses during July. While death losses in truck and rail shipments followed much the same trend during the fall, winter, and early spring months, there was a marked variation during the summer. Whereas the trend in losses in rail shipments was upward from April to July and downward from July to October, the summer was marked by two high periods of death losses in truck shipments, the first in May and the second in July.

The combined death losses among hogs delivered by both truck and rail between the time of unloading and time of weighing declined from February to June, advanced to the highest point of the year during July, August, and September, and then declined through December. When

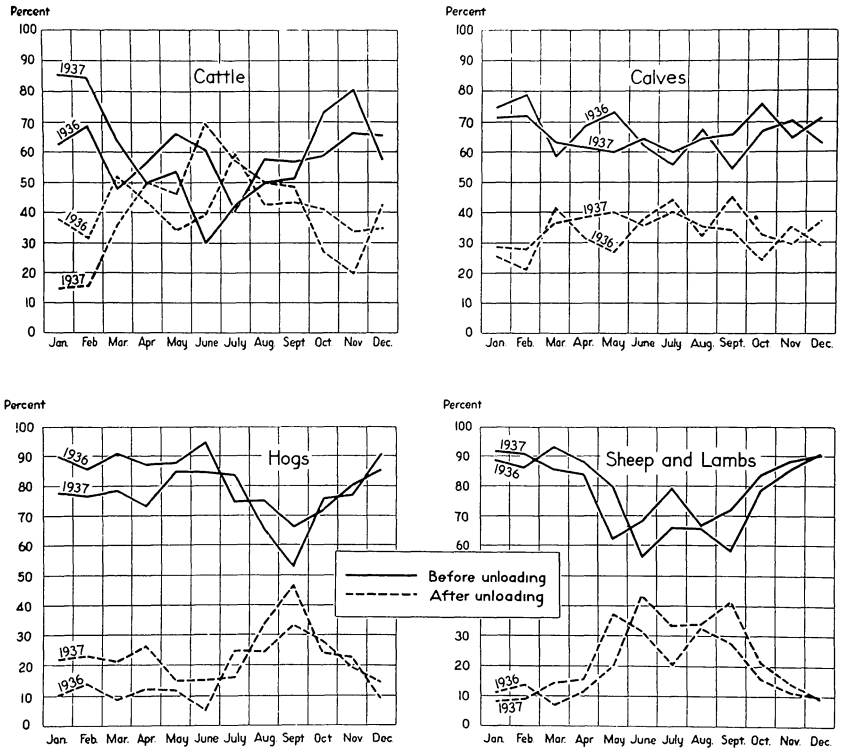


FIG. 2. SEASONAL DEATH LOSSES OF THE DIFFERENT SPECIES OF LIVESTOCK TO UNLOADING AND AFTER UNLOADING, SOUTH ST. PAUL, 1936-1937
(From St. Paul Union Stock Yards Company records)

all death losses are combined up to the time of weighing, the trend was downward from February to April, upward in May, downward in June, upward in July, downward to October, and then upward to February.

**Sheep and lambs.**—The heaviest death losses among sheep and lambs shipped by rail up to the time of unloading occurred during the early spring months, followed by the winter and late fall months. The least losses occurred from May or June through September. The same general trend was evident in truck shipments except for a tendency for losses to increase somewhat during the heat of the summer. Truck losses up to the time of unloading were much higher than rail losses throughout most of this two-year period.

There was little seasonal variation in losses between the time of unloading and time of weighing except during the spring of 1937 when the losses were greater than during the other nine months. When death losses among sheep and lambs are combined for both types of transportation up to the time of weighing, the trend was definitely downward from the high point of the year in March and April to August and September, followed by a sharp rise through the fall and winter months.

**Relation of death losses before loading to losses after unloading.**—The relative importance of death losses up to the time of unloading and between unloading and weighing is shown for each species in figure 2.

The per cent of death losses among cattle was much greater up to the time of unloading than after unloading from October through February, with considerably smaller differences in March, April, May, August, and September. During June and July, death losses were slightly greater between the time of unloading and weighing than at the time of unloading.

With the other three species, death losses up to the time of unloading exceeded those after unloading throughout the year. There was, however, considerable variation in the extent and seasonality of death losses between the different species. In the case of calves, death losses up to the time of unloading were nearly three times as heavy as after unloading during January and February, and slightly less than twice as great during most of the rest of the year. Death losses among hogs after unloading were only about one fifth the losses at the time of unloading from January through April, and even less during May, June, and December. During September, however, death losses after unloading represented about 40 per cent of the total loss. Death losses among sheep and lambs after unloading accounted for only about 10 per cent of the total loss during the winter months, but nearly one third of the total from May through September. In comparing losses after unloading with those recorded at the time of unloading, it should be remembered that the record of crippled stock at unloading includes only animals that are down or unable to move into the pens at that time. Much of the loss occurring after unloading probably is a result of injury suffered previously.

## Seasonal Variation in Crippled Losses

**Hogs.**—A much greater proportion of the hogs were crippled than any of the other species marketed at South St. Paul. There was also greater seasonal variation in the proportion of crippled hogs than of any of the other species except sheep and lambs. As shown in table 10, the seasonal trend in per cent of crippled hogs up to the time of unloading was sharply downward from the high point of the year in February to September and October, followed by a sharp advance to February. The trend in per cent of hogs that were recorded as crippled after unloading was downward from February or March to April, remained at about the same level through August, then declined to the low point of the year in October, followed by an upward trend through the winter months.

When the data are combined for hogs that were recorded as crippled both before and after unloading, the trend was sharply downward from February to September and October, followed by a sharp upward trend through the fall and winter months.

**Sheep and lambs.**—The proportion of crippled sheep and lambs up to the time of weighing was less than for any of the other species from July through December. However, the combined crippled losses were

slightly greater from February through May than in the case of cattle and calves. This resulted in a considerably greater seasonal variation in the per cent of crippled sheep and lambs than of crippled cattle or calves. There was also some difference in the proportion of crippled sheep and lambs arriving by rail and by truck. The highest proportion of cripples arriving by truck occurred in February, while the highest proportion of cripples in rail shipments was in April. The greatest losses for both types of transportation occurred from December through April, with the least losses from July through September. Crippled losses after unloading were less from July through December than during the first six months of the year.

**Cattle.**—Throughout 1936 and 1937, the percentage of crippled cattle arriving by truck ran considerably higher than in rail shipments. There was a tendency for the proportion of cripples arriving by rail to decline during the summer months, with a fairly pronounced increase during the fall and early winter. The highest proportion of cripples in truck shipments arrived during the late winter and spring, with another high point centering around August.

When the data up to the time of unloading for cripples arriving by rail and truck are combined, the highest proportion arrived from February through April, followed by a decline through September and October, with an upward trend through the winter months. The highest proportion of cattle that were recorded as crippled after unloading occurred during April and May. When the data for all crippled cattle up to the time of weighing are combined, the greatest losses occurred in April, followed by a decline through the late spring and summer, with an upward trend from October to the following April.

**Calves.**—Whereas the per cent of crippled cattle arriving by rail was lower than by truck, the reverse was true in the case of calves throughout most of the year. When losses are combined for the two types of transportation up to the time of unloading, there is little evidence of a seasonal influence on crippling. However, crippling[7] after unloading was higher in the late fall and winter than during the summer months. Total losses from crippling up to the time of weighing were therefore highest during these periods. The trend was downward from February to August and upward during the fall.

**Relation of crippled losses before loading to losses after unloading.**—The relationships between losses from crippling up to the time of unloading and between unloading and weighing are shown for each species in figure 3. The proportion of crippled cattle was from three to four times as great at the time of unloading as after unloading during January, February, and March, and over twice as high from July through December. The proportion recorded as cripped after unloading was considerably higher from April to June, with a ratio of about four cripples after unloading to five at the time of unloading during May.

[7] See definition of crippled animals, page 5.

Table 10. Seasonal Variation in Livestock Crippled Losses at South St. Paul During 1936 and 1937*

| | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| **Cattle** | | | | | | | | | | | | |
| To unloading | | | | | | | | | | | | |
| Rail—1936 | .032 | .007 | .041 | .045 | .016 | .023 | .030 | .021 | .047 | .052 | .070 | .108 |
| 1937 | .045 | .076 | .070 | .081 | .100 | .053 | .036 | .026 | .015 | .011 | .022 | .048 |
| Truck—1936 | .127 | .113 | .138 | .161 | .111 | .117 | .112 | .159 | .108 | .103 | .105 | .112 |
| 1937 | .133 | .199 | .150 | .166 | .140 | .120 | .145 | .151 | .151 | .119 | .122 | .105 |
| All shipments | | | | | | | | | | | | |
| 1936 | .098 | .083 | .106 | .109 | .079 | .072 | .065 | .066 | .065 | .070 | .089 | .112 |
| 1937 | .104 | .160 | .130 | .147 | .131 | .097 | .094 | .075 | .065 | .052 | .080 | .093 |
| After unloading | | | | | | | | | | | | |
| All shipments | | | | | | | | | | | | |
| 1936 | .041 | .045 | .031 | .050 | .059 | .033 | .023 | .038 | .026 | .032 | .038 | .052 |
| 1937 | .014 | .011 | .043 | .107 | .115 | .069 | .041 | .033 | .040 | .020 | .018 | .051 |
| Total losses | | | | | | | | | | | | |
| 1936 | .139 | .129 | .138 | .158 | .138 | .106 | .087 | .104 | .092 | .102 | .127 | .164 |
| 1937 | .117 | .170 | .173 | .253 | .247 | .166 | .135 | .108 | .105 | .073 | .097 | .143 |
| **Calves** | | | | | | | | | | | | |
| To unloading | | | | | | | | | | | | |
| Rail—1936 | .209 | .174 | .103 | .070 | .109 | .090 | .052 | .071 | .098 | .097 | .274 | .264 |
| 1937 | .288 | .169 | .240 | .374 | .103 | .239 | .047 | .118 | .079 | .185 | .032 | .150 |
| Truck—1936 | .052 | .060 | .069 | .091 | .047 | .032 | .060 | .040 | .034 | .057 | .054 | .065 |
| 1937 | .087 | .061 | .062 | .079 | .051 | .049 | .064 | .065 | .072 | .048 | .061 | .056 |
| All shipments | | | | | | | | | | | | |
| 1936 | .072 | .073 | .074 | .088 | .057 | .046 | .057 | .056 | .065 | .074 | .109 | .096 |
| 1937 | .111 | .074 | .086 | .125 | .060 | .089 | .059 | .085 | .075 | .085 | .057 | .065 |
| After unloading | | | | | | | | | | | | |
| All shipments | | | | | | | | | | | | |
| 1936 | .108 | .194 | .134 | .078 | .173 | .074 | .084 | .089 | .103 | .091 | .154 | .109 |
| 1937 | .115 | .202 | .078 | .081 | .103 | .067 | .099 | .050 | .063 | .091 | .192 | .138 |
| Total losses | | | | | | | | | | | | |
| 1936 | .181 | .268 | .208 | .166 | .230 | .120 | .141 | .145 | .168 | .165 | .263 | .206 |
| 1937 | .226 | .275 | .164 | .201 | .163 | .155 | .159 | .135 | .138 | .177 | .248 | .204 |

Table 10—(Continued)

| | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| **Hogs** | | | | | | | | | | | | |
| To unloading | | | | | | | | | | | | |
| Rail—1936 | .514 | .725 | .684 | .437 | .361 | .172 | .226 | .113 | .087 | .065 | .120 | .201 |
| 1937 | .340 | .633 | .615 | .411 | .412 | .300 | .295 | .204 | .125 | .202 | .317 | .549 |
| Truck—1936 | .580 | .741 | .619 | .480 | .439 | .383 | .272 | .122 | .094 | .127 | .194 | .250 |
| 1937 | .368 | .442 | .281 | .208 | .263 | .206 | .198 | .140 | .094 | .141 | .269 | .389 |
| All shipments | | | | | | | | | | | | |
| 1936 | .572 | .740 | .629 | .474 | .429 | .349 | .261 | .120 | .092 | .113 | .180 | .242 |
| 1937 | .364 | .470 | .327 | .237 | .286 | .222 | .216 | .150 | .099 | .153 | .278 | .443 |
| After unloading | | | | | | | | | | | | |
| All shipments | | | | | | | | | | | | |
| 1936 | .139 | .239 | .058 | .081 | .066 | .051 | .074 | .093 | .053 | .027 | .062 | .083 |
| 1937 | .076 | .127 | .183 | .062 | .079 | .072 | .088 | .071 | .060 | .027 | .051 | .097 |
| Total losses | | | | | | | | | | | | |
| 1936 | .711 | .978 | .686 | .555 | .495 | .401 | .335 | .213 | .145 | .139 | .241 | .325 |
| 1937 | .440 | .596 | .510 | .299 | .365 | .294 | .305 | .221 | .159 | .180 | .329 | .540 |
| **Sheep** | | | | | | | | | | | | |
| To unloading | | | | | | | | | | | | |
| Rail—1936 | .116 | .150 | .173 | .185 | .055 | .042 | .008 | .011 | .019 | .040 | .062 | .071 |
| 1937 | .088 | .149 | .146 | .215 | .070 | .018 | .020 | .016 | .022 | .036 | .048 | .087 |
| Truck—1936 | .166 | .236 | .104 | .125 | .088 | .100 | .062 | .039 | .030 | .041 | .028 | .069 |
| 1937 | .072 | .125 | .141 | .093 | .132 | .010 | .036 | .072 | .067 | .035 | .087 | .129 |
| All shipments | | | | | | | | | | | | |
| 1936 | .133 | .175 | .139 | .144 | .072 | .071 | .024 | .016 | .021 | .040 | .047 | .070 |
| 1937 | .080 | .134 | .143 | .135 | .102 | .015 | .024 | .026 | .035 | .036 | .067 | .110 |
| After unloading | | | | | | | | | | | | |
| All shipments | | | | | | | | | | | | |
| 1936 | .029 | .121 | .117 | .136 | .127 | .064 | .006 | .003 | .002 | .003 | .041 | .023 |
| 1937 | .033 | .092 | .010 | .025 | .211 | .069 | .035 | .001 | .013 | .014 | .016 | .011 |
| Total losses | | | | | | | | | | | | |
| 1936 | .162 | .296 | .256 | .280 | .199 | .135 | .030 | .019 | .024 | .043 | .088 | .093 |
| 1937 | .113 | .226 | .152 | .160 | .313 | .083 | .059 | .027 | .048 | .050 | .083 | .121 |

* Source: St. Paul Union Stock Yards Company records to unloading; packer purchases of crippled animals after unloading.

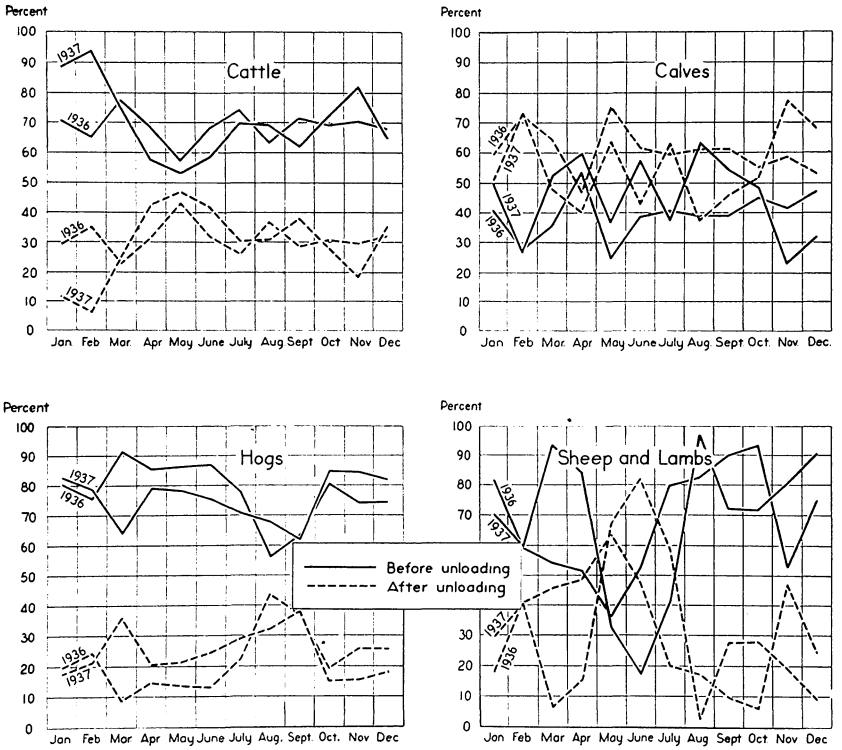


FIG. 3. SEASONAL CRIPPLED LOSSES OF DIFFERENT SPECIES OF LIVESTOCK TO UNLOADING AND AFTER UNLOADING, SOUTH ST. PAUL, 1936-1937

(Data from St. Paul Union Stock Yards Company records to unloading; packer records after unloading)

The proportion of hogs recorded as crippled between unloading and weighing was also much less than up to the time of unloading. Throughout most of the year the ratio was about one crippled hog after unloading to four at the time of unloading. However, there was less difference during August and September when the ratio was considerably less than one to two.

The proportion of sheep and lambs recorded as crippled after unloading was likewise less than up to the time of unloading except during May and June. The greatest difference occurred in August, when the ratio was about one crippled after unloading to nine at the time of unloading. During most of the fall and early winter the ratio was one to three or four.

In the case of calves, however, the proportion recorded as crippled between the time of unloading and time of weighing was slightly higher than at the time of unloading throughout the year except during April and August. During April a slightly higher proportion of the calves was recorded as crippled up to the time of unloading than after unloading, while the proportion was about the same during August.

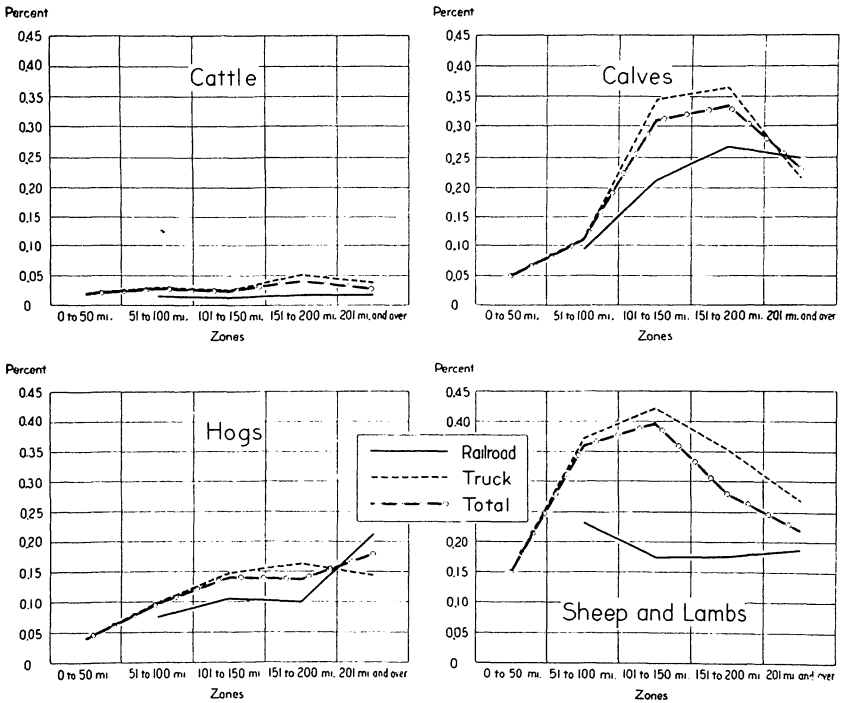


FIG. 4. THE PER CENT OF DEATH LOSSES IN MINNESOTA SHIPMENTS OF DIFFERENT SPECIES OF LIVESTOCK UP TO THE TIME OF UNLOADING AT SOUTH ST. PAUL BY DISTANCE ZONES

(Data from St. Paul Union Stock Yards Company bulletin sheets for one full week in each month during 1936-1937)

## Death Losses in Minnesota Shipments

Death losses in Minnesota shipments of the various species by rail, by truck, and by rail and truck combined, up to the time of unloading by distance zones,[8] are shown in figure 4 and table 11. These figures are based upon receipts during one full week in each month during 1936 and 1937.

**Cattle.**—Death losses in rail shipments of cattle were less for each 50-mile zone than in truck shipments. The per cent of death losses was

[8] Fifty-mile zones were used in this section of the study for the reason that insurance rates covering death and crippling losses in truck shipments to the South St. Paul market increase with each succeeding 50-mile zone up to 300 miles. Insurance rates covering rail shipments likewise increase with distance, with the following distance zones in effect in 1938: 1-150 miles, 151-350, 351-750, 751-1,100, and 1,101-1,450 miles. Insurance rates on both truck and rail shipments to this market cover death and crippling losses up to the time of weighing, and the actual mileage from point of origin to destination is used to determine the zone from which the livestock is shipped.

For an explanation of the method used in determining the various distance zones see footnote at the bottom of page 11. The number of head of livestock shipped by rail from the 0-50-mile zone was too small to supply adequate data on death and crippling losses, and hence the figures on losses in rail shipments from this zone are not included in the discussion or in figures 4 and 5. The first four 50-mile zones included all of southern and central Minnesota, where most of the livestock of the state is produced. Owing to the relatively small volume of Minnesota livestock shipped from beyond a radius of 200 miles of the market, which included counties in the northern and northwestern parts of the state, it was necessary to combine all rail receipts from this region into one zone designated as 201-miles-and-over. The same procedure was followed with respect to truck receipts from this area.

about twice as high in truck shipments as in rail shipments from the 51–100, 101–150, and 201-mile-and-over zones, and about three times as high in shipments from the 151–200-mile zone. Although this difference in the extent of losses was no doubt due largely to the type of transportation, it may have been influenced to some extent by the variations in the class of cattle shipped. For example, dairy cows may have constituted a higher proportion of cattle shipped by truck than by rail. Losses increased slightly with distance in rail shipments through the 201-mile-and-over zone and also increased with distance in truck shipments through the 151–200-mile zone. Death losses in truck shipments from the 201-mile-and-over zone were slightly less than in truck shipments from the 151–200-mile zone. This may have been due to a higher proportion of beef cattle in truck shipments from the more distant zone. As shown in table 12, death losses in rail shipments of cattle from North Dakota, Montana, and Canada were about the same as in shipments from

**Table 11. Minnesota Livestock Death and Crippled Losses Up to the Time of and During Unloading, at South St. Paul, by Distance Zones***

| Distance Zone, Miles | Receipts | | | Number Dead | | | Number Crippled | | |
|---|---|---|---|---|---|---|---|---|---|
| | Truck | Rail | Total | Truck | Rail | Total | Truck | Rail | Total |
| | | | | **Cattle** | | | | | |
| 0- 50 | 38,895 | 150 | 39,045 | 7 | ..... | 7 | 80 | ..... | 80 |
| 51-100 | 80,894 | 6,751 | 87,645 | 23 | 1 | 24 | 87 | 1 | 88 |
| 101-150 | 58,880 | 7,572 | 66,452 | 15 | 1 | 16 | 65 | 7 | 72 |
| 151-200 | 25,554 | 11,488 | 37,042 | 13 | 2 | 15 | 30 | 7 | 37 |
| 201 and over | 10,330 | 11,534 | 21,864 | 4 | 2 | 6 | 10 | 3 | 13 |
| Total | 214,553 | 37,495 | 252,048 | 62 | 6 | 68 | 272 | 18 | 290 |
| | | | | **Calves** | | | | | |
| 0- 50 | 55,373 | 256 | 55,629 | 27 | ..... | 27 | 23 | 1 | 24 |
| 51-100 | 62,846 | 4,249 | 67,095 | 70 | 4 | 74 | 29 | 12 | 41 |
| 101-150 | 20,647 | 6,650 | 27,297 | 71 | 14 | 85 | 24 | 20 | 44 |
| 151-200 | 15,336 | 7,118 | 22,454 | 56 | 19 | 75 | 14 | 17 | 31 |
| 201 and over | 6,996 | 6,879 | 13,875 | 15 | 17 | 32 | 3 | 13 | 16 |
| Total | 161,198 | 25,152 | 186,350 | 239 | 54 | 293 | 93 | 63 | 156 |
| | | | | **Hogs** | | | | | |
| 0- 50 | 145,601 | 1,124 | 146,725 | 56 | 2 | 58 | 295 | 5 | 300 |
| 51-100 | 300,395 | 18,607 | 319,002 | 297 | 14 | 311 | 810 | 66 | 876 |
| 101-150 | 145,293 | 29,493 | 174,786 | 213 | 31 | 244 | 543 | 81 | 624 |
| 151-200 | 51,993 | 33,246 | 85,239 | 84 | 33 | 117 | 228 | 125 | 353 |
| 201 and over | 6,302 | 7,086 | 13,388 | 9 | 15 | 24 | 13 | 20 | 33 |
| Total | 649,584 | 89,556 | 739,140 | 659 | 95 | 754 | 1,889 | 297 | 2,186 |
| | | | | **Sheep and Lambs** | | | | | |
| 0- 50 | 27,325 | 46 | 27,371 | 41 | ..... | 41 | 50 | ..... | 50 |
| 51-100 | 69,581 | 3,461 | 73,042 | 259 | 8 | 267 | 36 | 12 | 48 |
| 101-150 | 62,483 | 6,900 | 69,383 | 264 | 12 | 276 | 65 | 12 | 77 |
| 151-200 | 29,270 | 20,508 | 49,778 | 104 | 36 | 140 | 23 | 28 | 51 |
| 201 and over | 23,681 | 36,249 | 59,930 | 64 | 68 | 132 | 3 | 22 | 25 |
| Total | 212,340 | 67,164 | 279,504 | 732 | 124 | 856 | 177 | 74 | 251 |

* Source: From the St. Paul Union Stock Yards Company bulletin sheets. Records for one full week in each month during 1936 and 1937.

**Table 12. Percentage of Death Losses for the Various Species of Livestock Received by Truck and Rail by State of Origin, South St. Paul***

Proportion of Total State Receipts

| State | Cattle | | | Calves | | | Hogs | | | Sheep | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Truck | Rail | Total | Truck | Rail | Total | Truck | Rail | Total | Truck | Rail | Total |
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| Minnesota | .029 | .016 | .027 | .148 | .215 | .157 | .101 | .106 | .102 | .345 | .185 | .306 |
| North Dakota | .058 | .028 | .030 | .379 | .471 | .463 | .172 | .133 | .138 | .168 | .159 | .159 |
| Montana | .000 | .020 | .020 | .000 | .318 | .315 | .000 | .096 | .091 | .000 | .034 | .034 |
| Canada | †† | .019 | .019 | †† | .112 | .112 | †† | .494 | .494 | †† | ‡‡ | |
| South Dakota | .081 | .020 | .037 | .209 | .779 | .605 | .314 | .130 | .199 | .245 | .126 | .144 |
| Wisconsin | .051 | .000 | .049 | .136 | .000 | .133 | .061 | .098 | .062 | .209 | .164 | .206 |
| Washington | †† | .000 | .000 | †† | ‡‡ | | †† | ‡‡ | | †† | .020 | .020 |
| Iowa | .031 | .000 | .027 | .424 | .000 | .402 | .164 | .000 | .158 | .177 | .000 | .174 |
| All states | .033 | .022 | .027 | .149 | .329 | .192 | .100 | .121 | .104 | .329 | .087 | .177 |

* Source: St. Paul Union Stock Yards Company Bulletin Sheet records. Data based upon receipts during one full week in each month during 1936 and 1937. Losses are those occurring up to the time of and during unloading at the unloading docks.

† No shipments by truck to South St. Paul during this period.

‡ No shipments to South St. Paul by rail during this period.

the 201-mile-and-over zone in Minnesota. This suggests that death losses among cattle shipped by rail are fairly constant for distances beyond this zone.[9] This is probably influenced by the fact that the distant shipments include a higher proportion of beef cattle than do shipments from the 201-mile-and-over zone.

**Calves.**—Figures presented in table 5 (page 14) indicate that the per cent of death losses in rail shipments of calves up to the time of unloading was more than one third higher than in truck shipments to South St. Paul during 1936 and 1937. These figures were based upon all truck and rail receipts at South St. Paul from all sources up to the time of unloading. The data covering receipts from Minnesota for one full week in each month during 1936 and 1937 likewise show higher death losses among calves in rail shipments than in truck shipments, with a loss of 0.215 per cent in the former and 0.148 per cent in the latter. However, when the losses were tabulated by distance zones, it was found that death losses among calves were greater in truck shipments than in rail shipments for each zone within a radius of 200 miles of the market. Losses were only slightly higher in truck shipments than in rail shipments from the 51–100-mile zone but about one third higher in shipments from the 101–150- and 151–200-mile zones.

As shown in table 4, nearly three fourths of the calves that were shipped by truck to South St. Paul from Minnesota counties in 1936 and 1937 came from within a radius of 100 miles of the market and over 96 per cent from within a radius of 200 miles, while less than one fifth of the calves that were shipped by rail from Minnesota points came from within a radius of 100 miles of the market and about three fourths from within a radius of 200 miles. The high proportion of truck receipts of calves that came from the 0–50- and 51–100-mile zones, from which the death losses were much lower than in truck shipments from more distant zones, resulted in a comparatively low total death loss in truck shipments of calves from the state as a whole. Likewise, the relatively high receipts of calves in rail shipments from more distant zones, where losses were greater than in rail shipments from nearby zones, resulted in a higher average death loss in rail shipments of calves from Minnesota than in truck shipments.

Death losses among calves shipped by truck increased with distance through the 151–200-mile zone but declined in shipments from the following zone. Likewise, death losses in rail shipments increased with distance through the 151–200-mile zone and declined slightly in shipments from the next zone. The sharp decline in losses in truck shipments and the slight decline in losses in rail shipments from the 201-mile-and-over zone as compared with the 151–200-mile zone may have been due either to a higher proportion of calves from mixed breeds of cattle from the more

[9] There were also shipments of all species by truck from North Dakota, South Dakota, and Montana. However, the number was too small to warrant definite conclusions as to the extent of losses in truck shipments from distances beyond the 201-mile-and-over zone in Minnesota.

distant zone, or to greater care in loading the more distant shipments. However, since death losses in rail shipments of calves from North Dakota, South Dakota, and Montana were higher than in rail shipments from the 201-mile-and-over zone in Minnesota, it appears that death losses in rail shipments of calves increased with distance beyond this zone.

**Hogs.**—Death losses in rail shipments of hogs increased with distance through the 201-mile-and-over zone, while death losses among hogs shipped by truck increased with distance through the 151–200-mile zone but declined slightly in shipments from the 201-mile-and-over zone. Losses in truck shipments were higher than in rail shipments from those zones which supplied most of the hogs shipped from Minnesota to South St. Paul. In rail shipments of hogs from North Dakota and South Dakota, death losses were considerably less than from the 201-mile-and-over zone, while losses in the comparatively light rail shipments from Canada were much higher than from this zone. Owing to this variation in the per cent of death losses in rail shipments from other states, it was not possible to reach a definite conclusion as to the extent of such losses for distances beyond the 201-mile-and-over zone.

**Sheep and lambs.**—Death losses in truck shipments of sheep and lambs increased sharply with distance through the 101–150-mile zone and declined steadily thereafter through the 201-mile-and-over zone. The highest per cent of loss in rail shipments occurred in the 51–100-mile zone. Losses were less from the next zone and thereafter varied but little with distance through the 201-mile-and-over zone. Losses in rail shipments from North Dakota and South Dakota were somewhat less than in rail shipments from the 201-mile-and-over zone, and in rail shipments from Montana and Washington the losses were much less than from this zone. The reduction in death losses among sheep and lambs in rail shipments from beyond the 51–100-mile zone in Minnesota and the further reduction in losses in rail shipments from more distant states, as well as the reduction in losses in truck shipments beyond the 101–150-mile zone in Minnesota, may have been due either to difference in the breed or type of sheep and lambs, or to a tendency for a higher proportion of the more distant shipments to be forwarded in straight rather than in mixed loads.

## Crippled Losses in Minnesota Shipments

The extent of losses from crippling up to the time of unloading in Minnesota shipments of the different species of livestock by distance zones is shown in figure 5 and table 11. Losses are given for each type of transportation separately and for both types combined.[10]

**Cattle.**—The proportion of cattle that reached the market in a crippled condition in truck shipments was higher than in rail shipments from all zones covered by the data. Losses in truck shipments were about

[10] See footnotes at the bottom of pages 27 and 30.

**Table 13. Percentage of Crippling Losses for the Various Species of Livestock Received by Truck and Rail, by State of Origin, South St. Paul***

Proportion of Total State Receipts

| State | Cattle | | | Calves | | | Hogs | | | Sheep | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Truck | Rail | Total | Truck | Rail | Total | Truck | Rail | Total | Truck | Rail | Total |
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| Minnesota | .127 | .048 | .115 | .058 | .250 | .084 | .291 | .332 | .296 | .083 | .110 | .090 |
| North Dakota | .219 | .046 | .059 | .216 | .360 | .348 | .191 | .272 | .262 | .084 | .063 | .064 |
| Montana | .000 | .032 | .032 | .000 | .228 | .227 | .000 | .048 | .046 | .000 | .032 | .032 |
| Canada | .....† | .044 | .044 | .....† | .149 | .149 | .....† | .165 | .165 | .....† | .....‡ | ..... |
| South Dakota | .135 | .061 | .081 | .104 | .642 | .478 | .531 | .157 | .280 | ..... | .080 | .067 |
| Wisconsin | .203 | .169 | .202 | .064 | .107 | .065 | .227 | .246 | .227 | .029 | .164 | .037 |
| Washington | .....† | .000 | .000 | .....† | .....‡ | ..... | .....† | .....‡ | ..... | .....† | .004 | .004 |
| Iowa | .047 | .000 | .040 | .424 | 4.000 | .603 | .382 | .000 | .368 | .000 | .000 | .000 |
| All states | .135 | .043 | .091 | .061 | .292 | .117 | .286 | .296 | .288 | .078 | .049 | .060 |

* Source: St. Paul Union Stock Yards Company Bulletin Sheet records. Data based upon receipts during one full week in each month during 1936 and 1937. Losses are those occurring up to the time of and during unloading at the unloading docks.

† No shipments by truck to South St. Paul during this period.

‡ No shipments to South St. Paul by rail during this period.

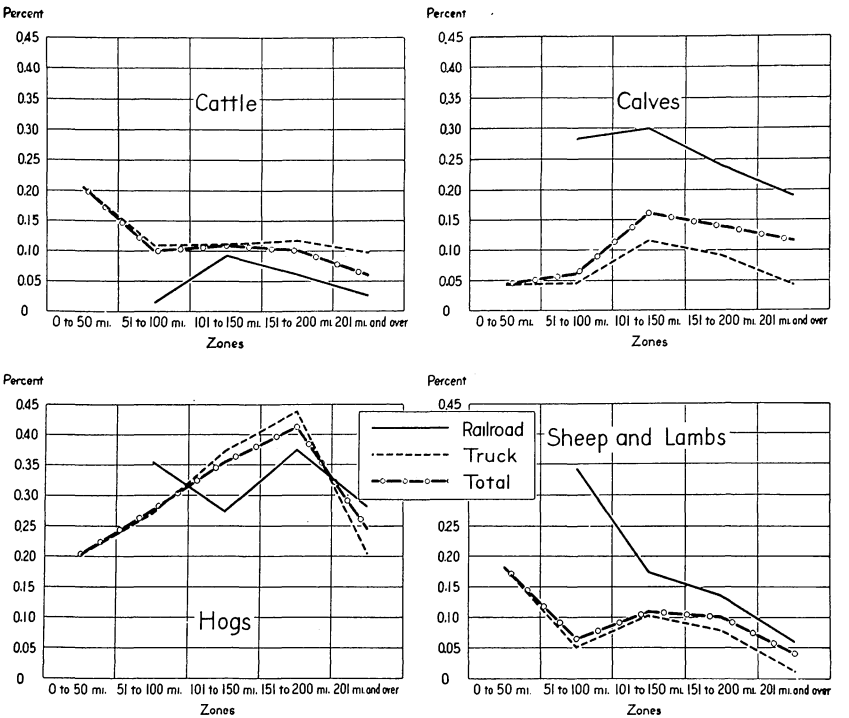


FIG. 5. THE PER CENT OF CRIPPLED LOSSES IN MINNESOTA SHIPMENTS OF DIFFERENT SPECIES OF LIVESTOCK UP TO THE TIME OF UNLOADING AT SOUTH ST. PAUL BY DISTANCE ZONES

(Data from St. Paul Union Stock Yards Company bulletin sheets for one full week in each month during 1936-1937)

twice as high from the 0–50-mile zone as in truck shipments from any other distance. Although it was not possible to determine definitely the cause of the heavier loss in truck shipments from the nearby zone than from greater distances, it may have been due to a higher proportion of discarded dairy cows in shipments from the 0–50-mile zone and to the fact that this class of cattle is more subject to crippling than other cattle. On the other hand, in rail shipments of cattle the extent of crippling increased with distance up to 150 miles and thereafter declined. Losses from crippling in rail shipments of cattle from the 201-mile-and-over zone were only about one third the loss from the 101–150-mile zone, but were as high as from the 51–100-mile zone. The decrease in losses in rail shipments from beyond the 101–150-mile zone was probably due to the increase in the proportion of beef cattle from the more distant zones. Since most of the cattle from within a radius of 150 miles of the market were shipped by truck while the proportion shipped by rail increased with distance, the combined loss curve approached the curve showing losses by truck for the nearby zones, and approached the rail-loss curve for the more distant zones. As a result, the per cent of crippled cattle in truck and rail shipments combined decreased with distance from the market

through the 201-mile-and-over zone. As shown in table 13, the proportion of crippled cattle in the relatively heavy rail shipments from North Dakota, Montana, and Canada was only slightly higher than in rail shipments from the 201-mile-and-over zone. Apparently the higher proportion of beef cattle than dairy cattle in shipments from other states tended to offset, at least in part, the distance factor.

**Calves.**—The proportion of crippled calves in rail shipments was much higher than in truck shipments from each zone. The difference was especially marked in shipments from the 51–100-mile zone, and tended to decrease with each succeeding zone thereafter. Losses from crippling in truck shipments increased for the first 150 miles and decreased slightly in shipments from subsequent zones. On the other hand, the proportion of crippled calves was only slightly higher in rail shipments from the 101–150-mile zone than from the 51–100-mile zone, and decreased rather sharply in shipments from the two more distant zones. When losses from both types of transportation are combined, the lowest proportion of losses occurred in shipments from the 0–50-mile zone and the highest from the 101–150-mile zone. The relatively higher losses in both rail and truck shipments from the 101–150-mile zone than from greater distances would seem to indicate that calves from specialized dairy herds were more subject to crippling than calves from less specialized herds. However, the relatively low losses from crippling in truck shipments from the first two zones, in which specialized dairy herds predominate, would appear to be due to the shorter time in which the calves were en route. Since the proportion of crippled calves in rail shipments from North Dakota, South Dakota, and Montana was higher than in rail shipments from the 201-mile-and-over zone, it appears that the extent of crippling in rail shipments of calves that are uniform as to age, breed, and condition increased with distance.

**Hogs.**—The proportion of hogs that were crippled in truck shipments increased sharply with distance through the 151–200-mile zone but declined greatly in shipments from the 201-mile-and-over zone. On the other hand, the proportion of crippled hogs in rail shipments declined with distance through the 101–150-mile zone, increased sharply in shipments from the 151–200-mile zone, and declined in shipments from the next zone. The cause of these variations in the extent of crippling in rail shipments of hogs could not be ascertained. When losses from both types of transportation are combined, the per cent of crippled hogs increased steadily up to 200 miles from the market. This included all of southern and central Minnesota, where most of the hogs of the state are produced. The proportion of crippled hogs in the fairly large volume of rail shipments from North Dakota was about the same as in rail shipments from the 201-mile-and-over zone.

**Sheep and lambs.**—The highest proportion of crippling in truck shipments of sheep and lambs occurred in shipments from the 0–50-mile zone, and the least losses from the 201-mile-and-over zone. However,

the decline was not uniform from zone to zone. Whereas crippling losses in truck shipments declined sharply from the 51–100-mile zone as compared with the 0–50-mile zone, death losses increased greatly. Thus it appears that as distance increases sheep and lambs that go down in the truck are apt to be dead upon arrival. On the other hand, crippling in rail shipments declined steadily with distance. When losses from both types of transportation are combined, the per cent of crippling declined sharply up to 100 miles from the market, increased slightly in shipments from the next zone, and thereafter declined. The proportion of crippled sheep and lambs in rail shipments from North Dakota was about the same as in shipments from the 201-mile-and-over zone, and in rail shipments from Montana and Washington considerably less than in shipments from this zone. This tendency for losses from crippling in rail shipments to decrease with distance may have been due either to differences in the type or breed of the sheep and lambs or to a higher proportion of straight rather than mixed loads from the more distant states.

## Other Factors Affecting Death and Crippling Losses

Based upon the assumption that for a given type of transportation, distance reflects the time en route, losses from death and crippling would be expected to increase with distance. However, this expectation would be based upon one further assumption, namely, that all factors other than distance remain constant. It is obvious that the latter assumption does not hold true for shipments to the South St. Paul market. Railway roadbeds and equipment, no doubt, are reasonably uniform over the territory served by this market, but greater care probably is exercised in bedding, loading, and feeding the more distant shipments. A higher proportion of improved public highways are to be found in the territory near the market than in more distant territory as roads serving this area tend to converge upon the market center of which South St. Paul is a part. The time required to cover an equal distance is less on improved roads and the comfort of the animals transported is greater than on roads that are not so well improved. On the other hand, it is probable that larger and more efficient trucks predominate in areas that are more remote from the market and that greater care is exercised in loading and partitioning the animals. This would tend to counteract, at least in part, the effect of distance on losses from death and crippling. The time of day during which the animals are en route would also be expected to influence losses that result from extreme temperatures. Variation in the care that is exercised in loading and unloading the livestock would also tend to keep losses from varying directly with distance.

Furthermore, there is a pronounced regional variation in the species and classes of livestock marketed from the different areas supplying this market. For example, dairying predominates throughout the central, north central, and northeastern parts of Minnesota. Beef cattle predominate in the southwestern and extreme west central parts of the state.

Hogs are produced chiefly in the southern and central districts, while the centers of sheep and lamb production are in the northwestern and southeastern districts. The type of sheep and lambs supplied by the western states varies from that produced in Minnesota, and beef cattle constitute a much higher proportion of the cattle shipments from these states.

There are also wide variations in the seasonal movement of the different species and classes of livestock from different parts of the producing territory. The pronounced seasonal variation in death and crippling losses in some species would have a direct bearing upon the extent of losses in shipments from the different regions. Death and crippling losses are usually higher in mixed than in straight loads. The fact that a higher proportion of nearby shipments are forwarded in mixed loads than is true of shipments from greater distances also influences the extent of losses from death and crippling.

Because it was not possible to isolate each individual factor, the data do not permit final conclusions as to the effect of distance on losses from death and crippling. However, the figures that were available should throw some light on the problem in so far as the South St. Paul market is concerned.

## Causes of Losses from Death and Crippling of Livestock in Truck Shipments

In connection with this study, an attempt was made to ascertain the relationship between certain trucking practices and losses from death and crippling. Two representatives of the Division of Agricultural Economics devoted several days and nights during each month from August through November 1937 to the assembling of data on trucking practice schedules on a random sample of truck loads of cattle, calves, and hogs as they arrived at the unloading docks. A total of 500 questionnaires were obtained. Of this number, only 38 trucks contained crippled or dead animals. The practices followed by the truckers in these 38 cases were analyzed and compared with the practices followed by a random sample of 200 of the 462 truckers who had no losses.

Based upon this limited sample, three factors stood out as possibly contributing directly or indirectly to losses. First, where losses were present, 69 per cent of the trucks were either overloaded or underloaded as contrasted with a compact load, while in trucks where losses were not present only 27 per cent of the loads were either overloaded or underloaded. Second, partitions were needed but not used in 75 per cent of the trucks in which losses occurred, while partitions were needed but not used in 51 per cent of the trucks in which there were no losses. Third, where losses were present, 23 per cent of the truckers were classified as unloading roughly, while where losses were not present only 6 per cent of the truckers followed this undesirable practice. Slippery floors, broken boards, sharp projections, and untied bulls or horned cattle were slightly more prevalent in trucks in which losses occurred than in trucks in which losses were absent.

## Suggestions for the Reduction of Death and Crippled Losses

This study indicates that losses from death and crippling that occur in transporting livestock to market are influenced by (1) the type of transportation, (2) the distance transported, (3) the season of the year, (4) the species, (5) the class within a given species, and (6) the carefulness of the trucker. While many of these factors are beyond the control of the shipper, the limited data obtained from the trucking practice schedules indicate that these losses can be reduced. That such losses in both rail and truck shipments can be reduced is also indicated by other studies that have been made.

The following suggestions are based largely upon the findings of other workers (Wiley, 1927; Henning, 1929; Russell *et al.*, 1922; Smith, 1937).

1. Livestock should not be fed excessively before loading. A light or normal feeding is preferred.

2. A well-cleated, gently inclined loading chute should be used in loading livestock at the farm or at the local shipping point. The chute should be located on high, well-drained ground.

3. The truck should be backed up squarely against the loading chute to prevent the animals from stepping through the opening between the truck and chute.

4. Sand or fine gravel should be used for bedding the car or truck to insure good footing. During the winter months the sand should be well covered with straw for all species, and a light covering of straw may be used during the summer for all species except hogs.

5. In shipping hogs during hot weather, the sand should be wet down before loading, and the hogs should be showered with water en route.

6. All protruding nails, bolts, broken boards, and other projections should be removed from the car or truck.

7. If double decks are used, the upper deck should be high enough so that all animals in the lower deck can stand in a natural position.

8. Cleated chutes should be used in unloading hogs, calves, and sheep and lambs from double-deck trucks. They should not be dropped or allowed to jump from the upper to the lower deck.

9. The car or truck should not be overloaded. Losses are lower in compact than in crowded or light loads.

10. Partitions should be used to separate small from large animals, and all bulls should be tied.

11. Trucks should be provided with covers to protect against extreme heat or cold. Proper ventilation is essential during hot weather.

12. The trucker should avoid sudden stops and should slow down on sharp curves to prevent the animals from piling up.

13. The load should be inspected frequently while en route to see that animals are not down or piling up.

14. Rough handling should be avoided in loading, while en route, and at the time of unloading. Canvas slappers should be used instead of clubs or whips. Sheep and lambs should not be lifted by the wool.

## SUMMARY

Many factors influence the extent of losses from death and crippling that occur between the time the livestock is assembled for loading at the farm and the time it enters the packing plant. Chief among these are the type of transportation used, the season of the year, the species, class, and condition of livestock, and the care that is exercised in loading, transporting, unloading, and handling the livestock at the market and between the market and slaughtering plant.

The trucking territory of the South St. Paul market expanded greatly during the 10 years 1928-1937. This expansion was accompanied by an upward trend in the per cent of death losses up to the time of unloading at South St. Paul in all species of livestock delivered by truck, and an upward trend in the per cent of crippled animals in all species delivered by truck except cattle, which declined. The trend in the per cent of death losses up to the time of unloading during this 10-year period was downward in rail shipments of all species except cattle, which remained about constant. The per cent of crippled cattle and sheep and lambs in rail shipments up to the time of unloading declined, remained fairly constant in rail shipments of hogs, and increased in rail shipments of calves.

For the years 1936 and 1937, losses up to the time of unloading both from death and from crippling were greater in truck shipments than in rail shipments for cattle and for sheep and lambs, about the same for hogs, and much less, in truck shipments than in rail shipments, for calves. When losses from both types of transportation are combined, there were from two to three times as many cripples as dead animals among hogs and cattle, but in sheep and lambs and in calves the dead animals were from two to three times as numerous as cripples. With respect to the proportion of dead animals on arrival, calves exceeded sheep and lambs, and ranked twice as high as hogs and five times as high as cattle. In per cent of cripples, hogs were nearly three times as high as cattle, four times as high as calves, and five times as high as sheep and lambs.

Studies were also made to compare losses on arrival at South St. Paul with those recorded at the yards between unloading and weighing. During 1936 and 1937, deaths occurring up to the time of unloading were approximately 60 per cent for cattle, 66 per cent for calves, and 80 per cent for hogs and for sheep and lambs, the remaining deaths being recorded between unloading and weighing. The percentage of cripples

occurring up to the time of unloading was approximately 66 per cent for cattle; 80 per cent for hogs; 33 to 50 per cent for calves; and 66 to 75 per cent for sheep and lambs. A considerable share of the animals reported as crippled in the yards probably had suffered previous injury or were not in a thrifty condition.

Significant seasonal variations were found in losses from death and crippling during 1936 and 1937 for each kind of livestock. Death losses in the combined rail and truck shipments of cattle up to unloading were about twice as high during the winter as in the summer. Crippling losses in cattle up to unloading were highest in rail shipments in fall and early winter, while in truck shipments crippling was greatest during the late winter, spring, and late summer. The highest proportion of crippling of cattle after unloading was recorded in April and May.

Although there was little evidence of seasonal variation in death losses in rail shipments of calves up to unloading, the heaviest losses in truck shipments occurred during the winter and early spring. Death losses after unloading were highest in winter and summer. There was little seasonal variation in crippling of calves up to unloading, but the proportion recorded as crippled after unloading was considerably higher during the late fall and winter.

Death losses in rail shipments of hogs up to unloading were highest during July, with a secondary peak in December, while losses in truck shipments followed the same general trend during the fall, winter, and spring, with a less pronounced rise during the summer. The highest proportion of crippling of hogs up to unloading in both rail and truck shipments occurred in the late fall and winter, with the peak in February. In losses after unloading, the highest proportion of deaths occurred during the summer, while the highest proportion of cripples was recorded during the late winter, with the low point of the year in October.

Death losses in both rail and truck shipments of sheep and lambs up to unloading were highest during the spring and lowest in summer, while crippling was most prevalent from December through April and lightest from July through September. After unloading, the highest proportion of crippling was recorded during the first half of the year, death losses showing little seasonal change.

Losses from death and crippling up to the time of unloading in shipments of livestock from Minnesota points showed no consistent relationship to the distance transported. This was probably due to differences in the class, type, age, and condition of the livestock shipped from the different districts. For example, it is probable that a higher proportion of mixed shipments and a higher proportion of discarded dairy cows and veal calves come from the nearby zones than from the more distant zones. For shorter hauls it is also likely that less attention was given to careful loading and to the type of equipment used.

Greater care in assembling, loading, and transporting the livestock to market and in handling the animals after they arrive can be expected to reduce materially the losses from death and crippling.

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